REPORT No. FAA-EE-80-27

LEVEL II

(15)

DETERMINATION OF POLLUTANT EMISSIONS CHARACTERISTICS OF GENERAL ELECTRIC CF6-6 AND CF6-50 MODEL ENGINES

AD A088927

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March 1980

FINAL REPORT

Prepared for

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
OFFICE OF ENVIRONMENT AND ENERGY
WASHINGTON, D.C. 20591

(18) FAA-AEE

Technical Report Documentation Page

1. Report No. (19)	2. Government Accession No.	3. Recipient's Catalog No.
FAA-EE-80-27	AD-A088 927	

4. Title and Subtitle (6)

Determination of Pollutant Emissions Characteristics of General Electric CF6-6 and CF6-50 Model Engines

5. Report Date (11)
March 1980

6. Performing Organization Code (12)

8. Performing Organization Report No.
198

7. Author(s) (10)
T.F. Lyon, W.J. Dodds, D.W. Bahr

(14) R80AEG420

9. Performing Organization Name and Address
General Electric Company
Aircraft Engine Group
Cincinnati, Ohio 45215

10. Work Unit No. (TRAIS)

11. Contract or Grant No. (15)
DOT-FA78WA-4207 new

13. Type of Report and Period Covered (9)
Final Report
October 1978-December 1979

12. Sponsoring Agency Name and Address
U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy
Washington, D.C. 20591

14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

The average levels and the variability of emissions were determined for newly manufactured General Electric CF6-6 and CF6-50 model engines. Emissions of carbon monoxide, hydrocarbons, oxides of nitrogen, and smoke were measured on a total of twenty-five engines. Emissions were measured from two seperate sampling systems, one sampling in the FAA diamond pattern, and the other in the EPA cruciform pattern. Only small diferences in emissions were found between the two sampling patterns.

Typical variability in CF6 production engine emissions was found to be somewhat less than had been previously reported for other types of large, turbofan engines. The effect of differences in fuel types, and in idle conditions (hot or cold) on emission levels were also determined.

17. Key Words	18. Distribution Statement
Exhaust Emissions CF6 Gas Turbine Engine Emissions Gas Turbine Combustion Production Engine Emissions Exhaust Emissions Variability	This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	106	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

AD A088927

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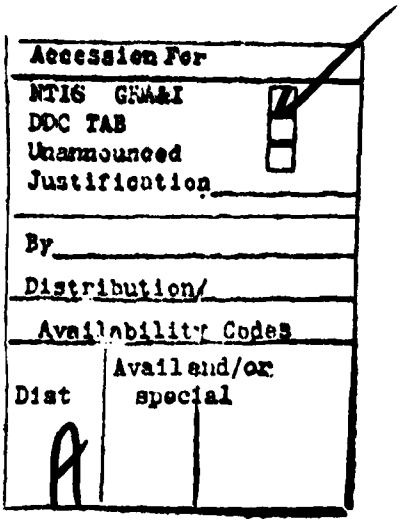

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has promulgated standards regulating exhaust emissions from aircraft gas turbine engines (Title 40, Code of Federal Regulations, Part 87). The EPA has also stated that the standards are to be considered upper limits with respect to compliance testing. This stipulation implies that the worst engine must meet the standard; thus, the average engine must be below the standard by an amount depending on the overall measurement variability.

Therefore, there are two approaches for compliance testing: either every engine would be tested and shown to be in compliance with the standard, or a sampling of engines would be tested and the test data would be used to demonstrate statistically, and with a high degree of certainty, that "all" of the engines of that particular model will meet the standards. Since testing every engine for compliance with emissions standards would be extremely costly and time consuming, it is obviously more desirable to demonstrate compliance based on tests of a statistically significant sampling of engines of a particular model. The magnitude of emissions variability would thus be a key factor in the formulation of an aircraft engine emissions standards compliance procedure.

The purpose of this program is to determine the average levels and the variability of emissions from newly manufactured General Electric CF6-6 and CF6-50 model engines. To accomplish this, the emissions characteristics of seven CF6-6 and eighteen CF6-50 production engines were measured in a series of carefully controlled tests.

This program is part of an ongoing effort by the FAA to establish a broad data base from which regulations can be established to assure compliance with EPA aircraft emissions standards.

2.0 SUMMARY

Emissions of carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NO_x), and smoke were measured on a total of twenty-five newly manufactured CF6 aircraft turbine engines. The emissions tests were conducted in the production engine test cells at the General Electric Evendale Plant following the normal factory acceptance tests. The tests were divided into three series. In the first, twelve CF6-50C2 model engines were tested using JP-4 fuel. The second series consisted of tests of six CF6-50C2 engines with Jet A fuel, and the third was a series of seven CF6-6D engines using Jet A fuel.

The emissions tests were conducted according to test procedures specified by the EPA for measurement of emissions from aircraft gas turbine engines. The emissions are calculated from measurements made during a simulated landing-takeoff cycle consisting of the following five power settings in the specified order: taxi/idle (out), takeoff, climbout (85 percent), approach (30 percent), and taxi/idle (in).

Emissions samples were taken from the exhaust stream using a manifolded rake system specifically designed and constructed by General Electric for this program. The major feature of this rake system was the capability for rapid installation and removal from the test cell. The rake system contained two sampling systems, one sampling in the FAA diamond pattern, and the other in the EPA cruciform pattern. Only small differences were found in emissions from the two sampling patterns.

The emissions test data include both engine performance parameters and emissions data. These data are tabulated on emissions summary sheets, two pages for each engine tested. The complete test summary tabulations are given in appendices to this report.

The emissions variability information was summarized for each engine test series. Typical variability for CF6 production engines was found to be somewhat less than had been previously reported for other types of large, turbofan engines. The effects of differences in fuel types, and in idle conditions (hot or cold) on emissions levels were determined as a part of these evaluations.

3.0 ENGINE EMISSIONS TEST SETUP

The CF6 engine emissions tests were conducted in production test cells M34 and M35 in Building B at the General Electric Evendale, Ohio plant. The emissions tests of each engine followed the normal factory acceptance test. The emissions analysis instrumentation and procedures were those generally utilized by General Electric for engine emissions testing. A new emissions sampling rake was, however, procured and utilized for these tests. This rake was specifically designed to permit rapid installation and removal from the test cell so as not to seriously delay the production test schedule.

This section of the report describes the CF6 engine models and the engine test facility, along with the exhaust sampling rake and the emissions analysis system.

3.1 CF6 ENGINE DESCRIPTION

The CF6 engine family consists of twin-spool, high bypass turbofan engines used principally to power large, wide-body commercial transports. The CF6 combines high bypass ratio with high component efficiency and increased turbine operating temperatures to produce low operating costs, low sound levels, low smoke, and high performance. A typical CF6-50 installation is shown in Figure 1.

The first version of the CF6 developed was the CF6-6, which was based on the core engine of the military TF39 with a new low pressure system. The CF6-6 has dual rotors and variable compressor stators. Its single-stage fan and single-stage low pressure compressor are driven by a five-stage low pressure turbine through a shaft concentric with the core engine. The fan provides about 85 percent of the thrust at takeoff power. The core engine consists of a 16-stage axial flow compressor with variable stators, an annular combustor, and a two-stage air cooled turbine.

The CF6-6 engine powers the McDonnell Douglas DC-10 Series 10 tri-jet aircraft. The most current production engine is the CF6-6D model rated at 39,300 pounds takeoff thrust. In the present program, seven CF6-6D engines were tested.

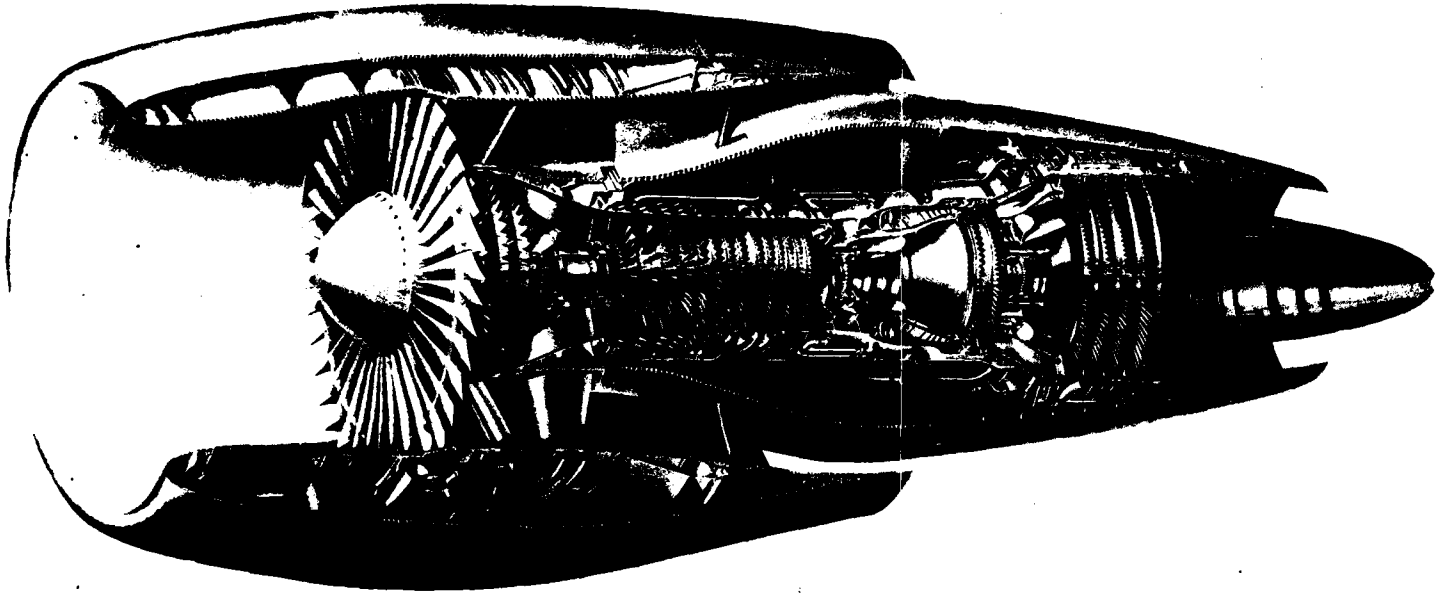


Figure 1. General Electric CF6-50 High Bypass Turbofan Engine.

The CF6-50 engine series is the higher thrust version of the CF6. The major component differences between the CF6-50 and the CF6-6 are that the CF6-50 has additional low pressure compressor stages (three versus one), fewer high pressure compressor stages (14 versus 16), and fewer low pressure turbine stages (four versus five). The major increase in thrust of the CF6-50 over the CF6-6 within basically the same engine envelope is a consequence of its higher airflow, fuel flow, and pressure ratio.

The CF6-50 engine series (50,000 pound thrust class) has a wide range of applications, which include the three-engine McDonnell Douglas DC-10 Series 30 long range tri-jet, the two-engine Airbus A300B, and the four-engine Boeing 747. The military version of the CF6-50, designated the F103, is being produced for the Boeing E-4A command post version of the 747 aircraft and has been flown in the Boeing YC-14 short takeoff and landing vehicle.

Because of the wide range of applications of the CF6-50 engine, the current production includes several models. In the present program, a total of eighteen CF6-50C2 engines were tested. This particular model was chosen because it is the highest rated thrust (51,800 pounds) version currently in production, and is equipped with improved fan blades which have been recently introduced.

The CF6 engine combustion system consists of 30 pressure atomizing, duplex-type fuel nozzles in an annular combustor. Axial swirlers in the combustor dome provide the intense mixing of fuel and air required for good combustion stability and low smoke emissions. While generally similar, the CF6-50 combustor and fuel nozzles are sized to accommodate air and fuel flows considerably higher than the CF6-6. The CF6-50 combustor is nearly three inches shorter than the CF6-6.

Except for the low smoke features, the current production CF6 combustion system is not equipped with emission abatement features and does not meet the presently proposed EPA standards (Reference 1) for gaseous emissions.

3.2 PRODUCTION ENGINE TEST FACILITY

The Evendale Plant production engine test facility for large turbofan engines consists of two test cells separated by a common access area on the lower level and by a control room on the second level. Engine access is through a large vacuum-sealed door on the side wall of each test cell. Each test cell has a horizontal, sound-treated, air inlet system and a vertical sound-treated exhaust system.

A cross section of the test cells is shown in Figure 2, along with the principal facility dimensions. The large access door and adequate room between the engine exhaust nozzle and the augmentor permitted ready installation and removal of the emissions rake system. Modifications to these cells required for the emissions tests included installation of a feed-through in the cell wall for the sample line, and installation of anchors in the floor to fix the rake system in position.

The test cell data acquisition and processing system provides an automatic means of determining engine performance. Test data is fed to the digital data acquisition system and then transmitted to the Honeywell 600 computer via a telephone data link. The H6000 converts the data to engineering units and calculates the engine performance. The test data and performance parameters are then printed out on the test cell teletype terminal.

3.3 ENGINE EMISSIONS SAMPLING SYSTEM

Emissions samples were withdrawn from the exhaust stream with a manifolded rake system specifically designed and constructed by General Electric for this program. The major design consideration for this system was the capability of rapid installation and removal from the test cell so as to avoid as far as possible any interference with the normal production test schedule. This was achieved by mounting the sampling rake head on a single pylon which was supported on a large base, which, in turn, was anchored to the test cell floor. The rake was positioned behind the engine prior to each emissions test.

Overall Test Cell	188'l x 30'w x 20'h
Inside Test Chamber	104'l x 30'w x 20'h
Engine Access Door	35'w x 16'h
Personnel Doors	3'w x 7'h
Open Intake Stack	23'9"l x 30'w x 22'h
Intake Plenum	32'l x 30'w x 20'h
Augmenter & Blast Suppressor	10'dia. x 54'l
Exhaust Stack	25'l x 30'w x 40'h

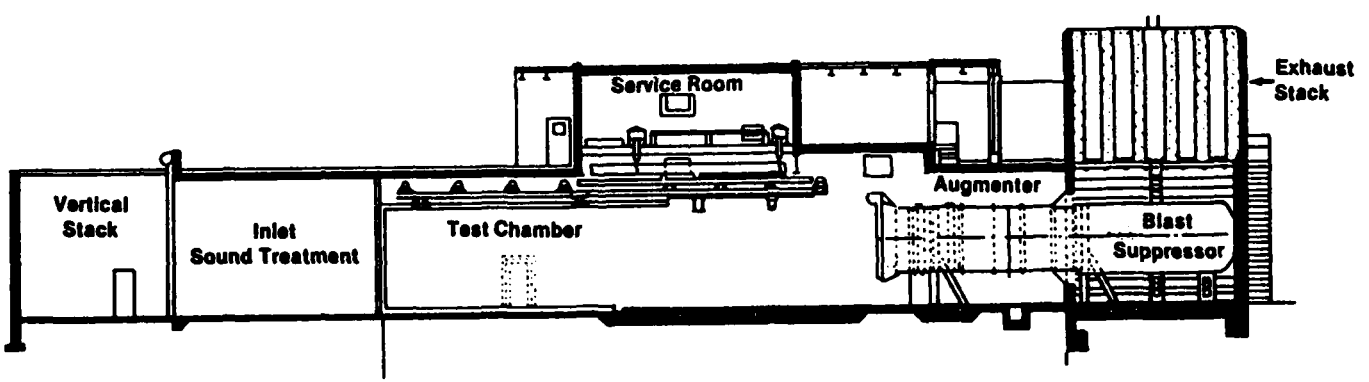


Figure 2. Production Engine Test Cell Cross Section

Samples were withdrawn from the exhaust stream using two different sample patterns, each consisting of twelve separate orifices manifolded together. In the first sampling pattern, known as the FAA diamond pattern, the orifices are on an arc which is located at 63 percent of the exhaust nozzle radius. The orifices are divided into four groups of three each, with each group located in a separate quadrant. In each group the orifice separation is four percent of the exhaust nozzle diameter. In the second sampling pattern, known as the EPA cruciform pattern, the three orifices in each quadrant are radially spaced on centers of equal area. It might be noted that the FAA developed diamond pattern does not quite conform to the EPA specified (Reference 1) minimum orifice separation, which is 0.1 times the nozzle radius (5 percent of nozzle diameter).

In order to avoid fabrication of two separate probe heads, and to avoid the time and expense involved in changing probe heads each time a different model engine was tested, the same sampling head was used for sampling both the CF6-6 and CF6-50 engines, even though the nozzle dimensions are somewhat different for the two engine models. A comparison of the nozzle dimensions for the CF6-6 and CF6-50 engines is shown in Figure 3. As shown in this sketch, the CF6-50 has a somewhat larger exhaust area than does the CF6-6 (35.96 inches diameter versus 32.48 inches diameter), and the CF6-50 exhaust plane is located 6.1 inches forward of the CF6-6 exhaust plane.

Some compromise was thus necessary in locating the orifices for the two sampling patterns. For the diamond pattern, the orifice locations were calculated using the average nozzle diameter of the two engines. For the cruciform pattern, the orifices were radially spaced based on the CF6-6 nozzle diameter. Figure 4 shows details of the orifice locations in one of the four rake arms. All orifices are 0.031 inch in diameter. This value was chosen so as to give adequate pressure drop across the orifices at the required total sample flow rate of about one standard cubic ft per min. Figure 5 is a photograph of the emissions sampling rake head.

Figure 6 shows the emissions rake installed in the exhaust stream of a CF6-50C2 engine. The rake is fixed to the floor with eight bolts. Slotted bolt holes in the base permit sideways alignment of the rake behind the

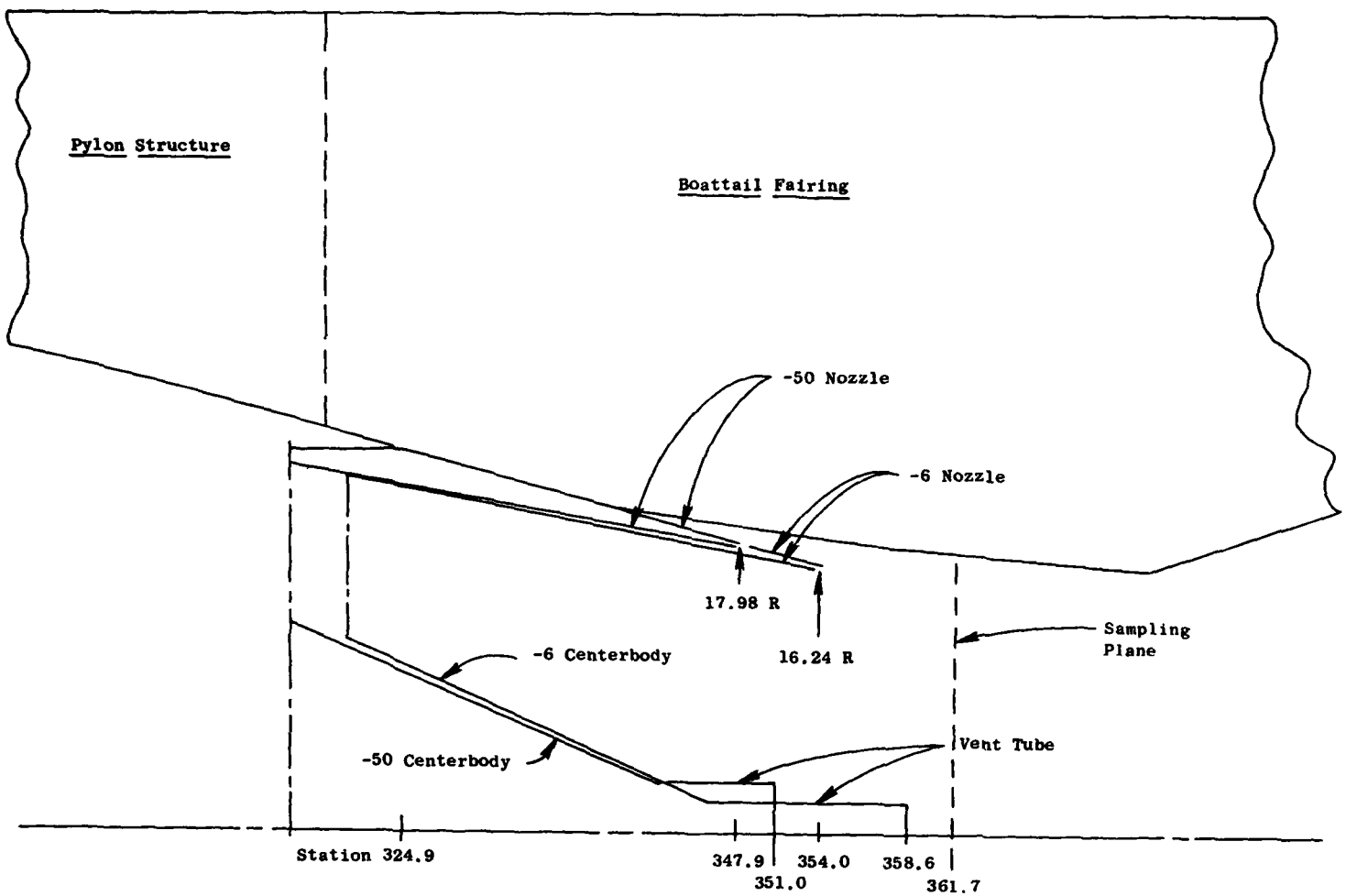


Figure 3. CF6-50/CF6-6 Conical Nozzle Comparison, Acceptance Test Configuration.

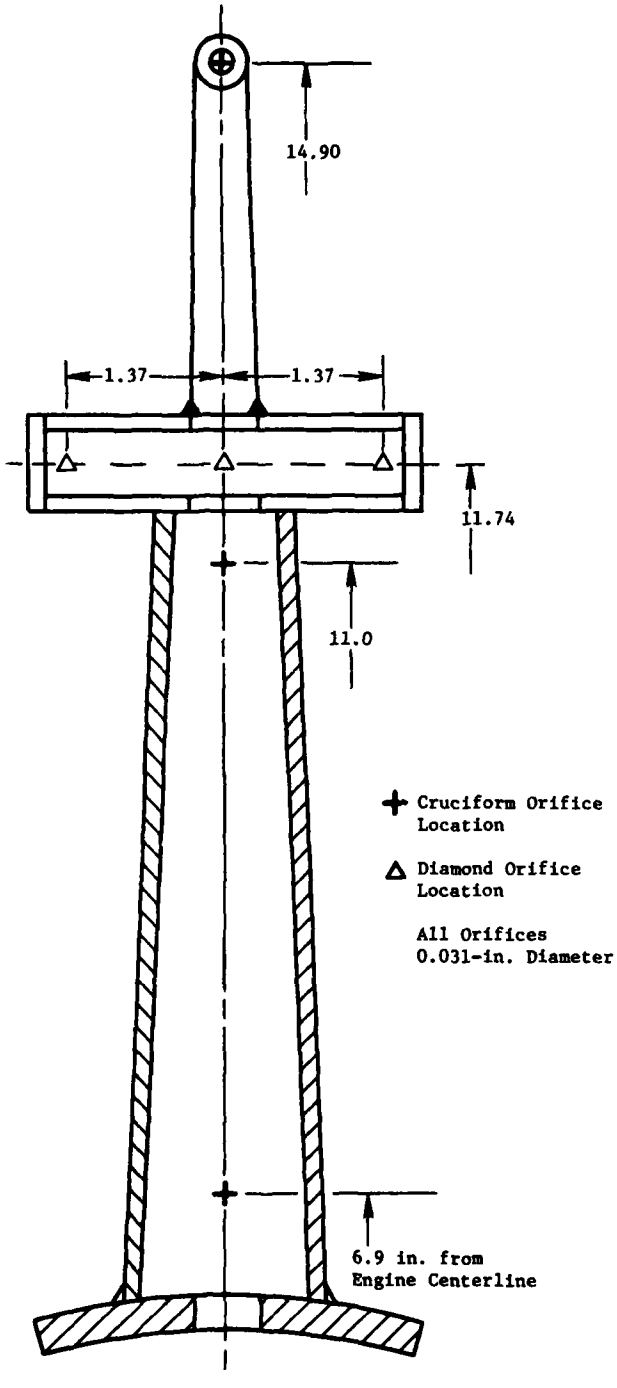


Figure 4. Rake Arm (One of Four) Showing Sampling Orifice Locations.

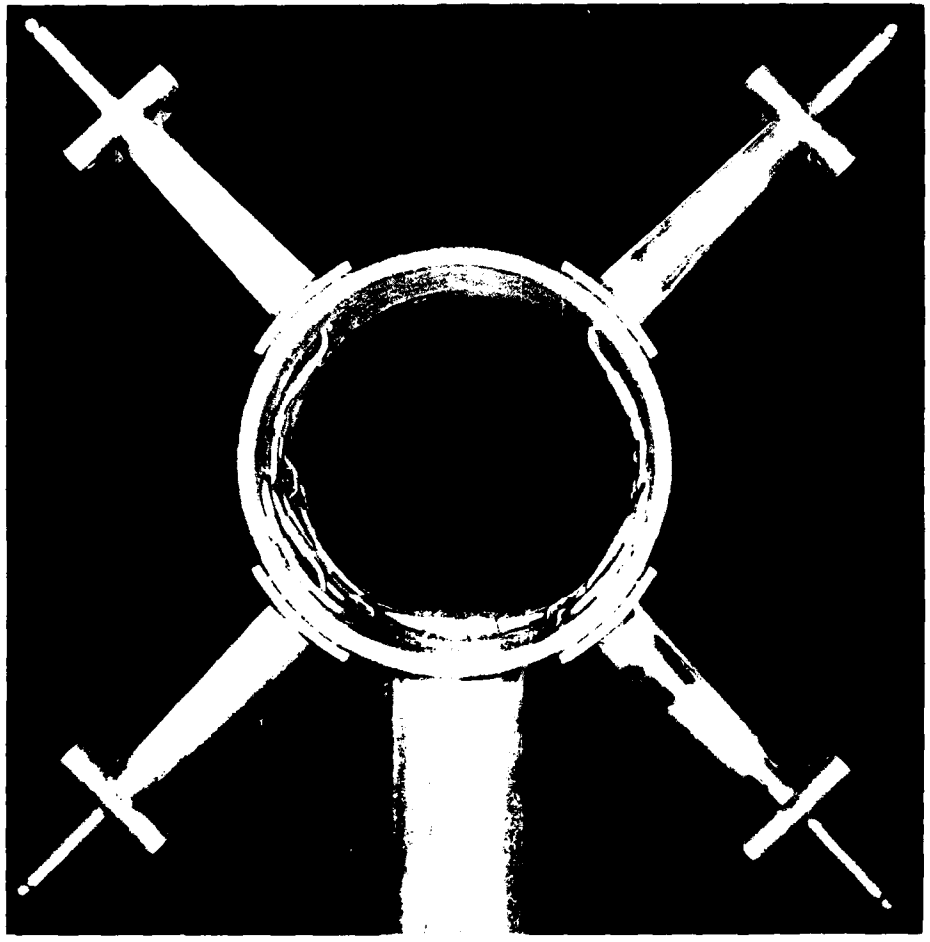


Figure 5. Emissions Sampling Rake Head.

Figure 6. Emissions Sampling Rake Installed in Cell M35 Behind CF6-50C2 Engine.

engine. Before an engine test, the rake was carefully positioned behind the engine and bolted to the test cell floor. Between engine tests the rake was stored in the test cell with sample lines attached. The two sample lines made of electrically heated teflon were passed down from the rake head inside the rake pylon, across the floor, and out through the cell wall to the analysis instrumentation located just outside the cell wall.

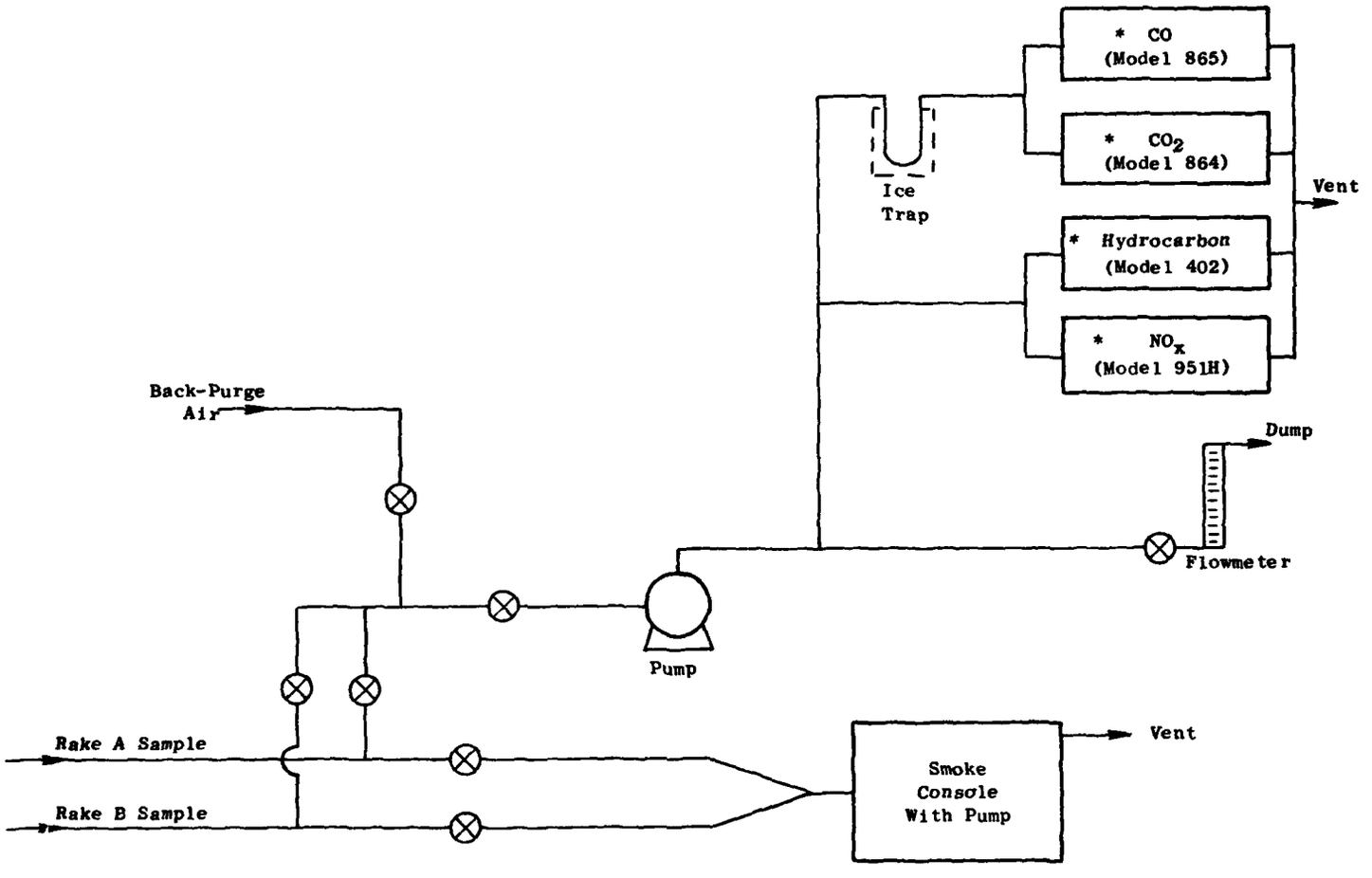
3.4 EMISSIONS ANALYSIS SYSTEM

Samples from the emissions sampling rake passed to the sample handling system as shown in Figure 7. The sampling system was arranged so that one sample was analyzed for gaseous emissions while smoke was measured on the other. The rake was backpurged with air to prevent rake contamination by fuel during engine startup and shutdown. The dump flow was used to increase the sample flow rate and reduce the residence time. All sample lines were electrically heated and maintained at a temperature of about 300°F up to the hydrocarbon analyzer.

The emissions analysis system is shown in Figure 8. The gaseous emissions portion of the system was specifically designed and packaged by General Electric for compactness and portability. The four gas analyzers are manufactured by Beckman Instruments, Inc. The CO (Model 865) and CO_2 (Model 864) analyzers are nondispersive infrared instruments. The NO/NO_x analyzer is a Model 951 heated chemiluminescence analyzer with thermal converter, and the HC analyzer is a Model 402 flame ionization instrument.

The two standard relay racks house the four gas analyzers along with the readout devices, flowmeters, flow control valves, and solenoid operated calibration gas valves. Two double-pen recorders provide a permanent and continuous record of the instrument outputs, while the actual test values are more quickly and conveniently read from a digital millivoltmeter which is switched from one analyzer output to the other.

The smoke measurement console (shown on the left in Figure 8) is a General Electric-designed system and conforms to all requirements of both the EPA and the SAE procedures. A major automated feature of this system is that after selection of a sample volume (in 0.05 cubic foot increments),



*Gas Analyzers - Beckman Instruments, Inc.

Figure 7. Schematic of Sampling and Analysis System.

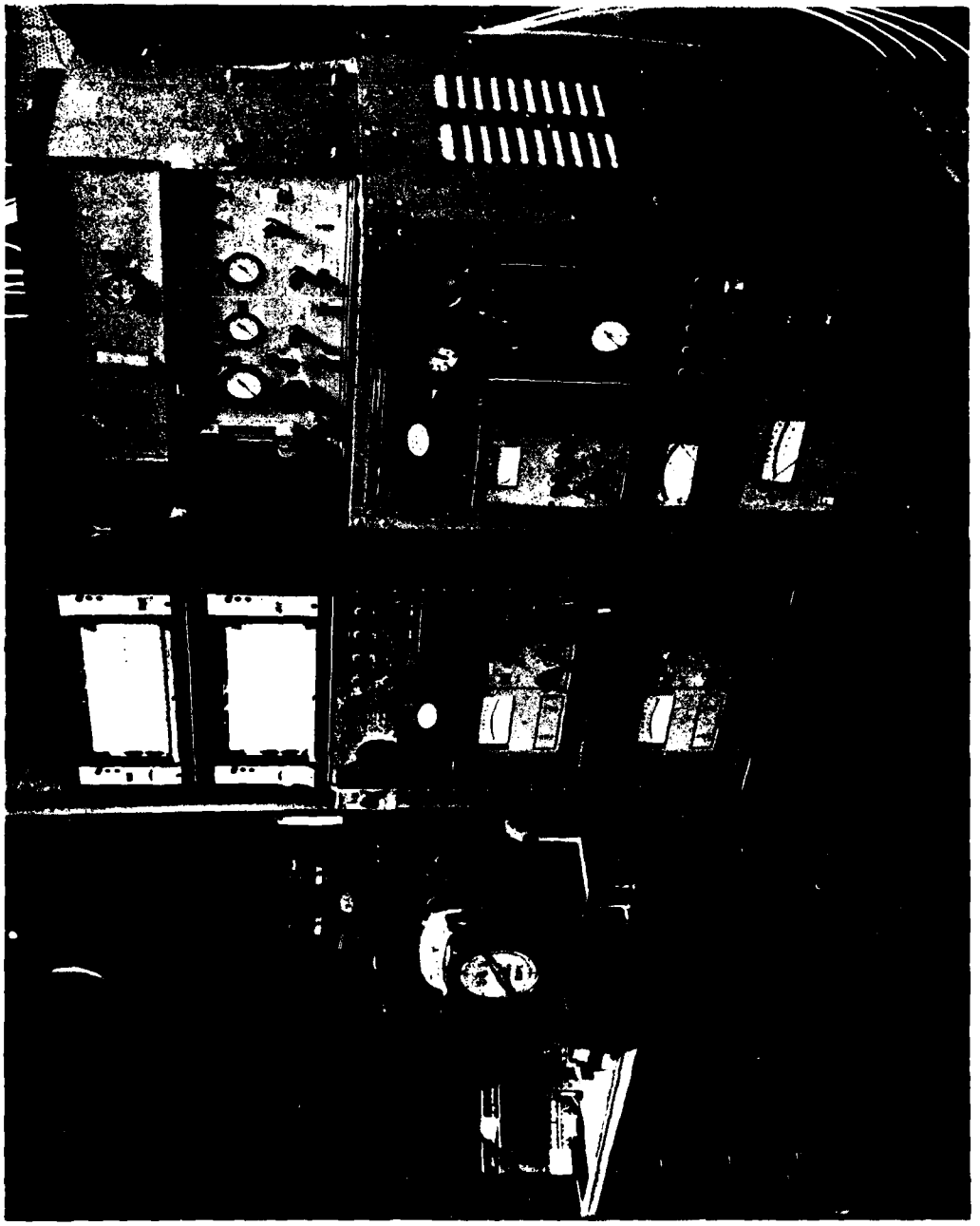


Figure 8. Emissions Analysis System.

the sampling cycle is started and stopped automatically with the push of a single button.

The gaseous emissions analyzers were calibrated with certified mixtures of propane in air, CO and CO_2 in nitrogen, and NO in nitrogen. Each analyzer was calibrated with four separate mixtures in concentrations such as to cover the range of concentrations of gas samples from the engines. Each calibration gas was certified by the vendor to an accuracy of 2 percent of the concentration. In addition, the calibration gases were compared at General Electric to Standard Reference Material (SRM) mixtures which are obtained from the National Bureau of Standards and are certified accurate within 1 percent. A complete calibration was performed both before and after each engine test.

4.0 CF6 PRODUCTION ENGINE EMISSIONS TESTS

The original plan for this program was to run emissions tests on both CF6-50 and CF6-6 model engines using JP-4 fuel, which was the only fuel available in the production engine test cells when this program was initiated. Due to a combination of circumstances, the fuel used in production engine tests was changed from JP-4 to Jet A after the initial tests of the CF6-50, but before the CF6-6 tests. After Jet A became available, an additional series of CF6-50 engines was tested on Jet A fuel, in lieu of the previously planned single test comparing emissions on JP-4 with Jet A. As a result, the engine tests were divided into 3 separate groups, as follows:

1. Tests of twelve CF6-50C2 model engines on JP-4 fuel.
2. Tests of six CF6-50C2 model engines on Jet A fuel.
3. Tests of seven CF6-6D model engines on Jet A fuel.

Each test consisted of emissions measurements at the EPA specified power settings. The emissions tests were run following the normal factory acceptance test and thus the engine was in the acceptance test configuration.

This section of the report describes the emissions test and data reduction procedures and presents the engine test results.

4.1 ENGINE EMISSIONS TEST PROCEDURE

An engine emissions test on this program consisted of emissions measurements at the five EPA specified (Reference 1) power settings of ground idle, takeoff, 85 percent, 30 percent, and ground idle. As specified in the EPA procedure, the test points were run in the sequence shown. For the purpose of these tests, takeoff power is defined as the FAA certificated takeoff thrust level at sea level static, standard day conditions, and corresponds to the engine nameplate rating. For engine cycle calculations, this is the uninstalled thrust level of an engine with acceptance test cowling. The nameplate thrust of the CF6-50C2 is 51,800 pounds and for the CF6-6D is 39,300 pounds. This rated thrust level is also used to calculate the gaseous emissions levels in terms of the prescribed EPA Parameter.

The normal acceptance test throttle setting was used to set the ground idle test points. This corresponded to a corrected core engine speed of approximately 6300 rpm for the CF6-50C2 engines, and approximately 5600 rpm for the CF6-6D. For the other test points (takeoff, 85 percent, and 30 percent), corrected fan speeds were set which corresponded to the specified thrust settings, as determined by the most recent engine cycle based on production engine performance. These high power corrected fan speed settings were 3804, 3477, and 2309 rpm, respectively, for the CF6-50C2 engines, and 3400, 3200, and 2070 rpm for the CF6-6D engines. It might be noted that the corrected fan speed corresponding to takeoff thrust for these emissions tests is somewhat lower than for the normal factory acceptance tests, since the thrust must exceed the rated level for the acceptance test, while the emissions test is run at the rated thrust level.

The normal emissions test sequence involved pre-test operations such as installation of the emissions rake, calibration of the emissions analysis equipment and heat-up and checkout of the sampling system. These operations consumed 2 to 3 hours. Actual engine operation for the emissions test took about 1 hour. Post-test calibration and removal of the rake system consumed another hour for a total test time of 4 to 5 hours. Further test related activity included gaseous emissions data reduction, smoke data reduction, fuel analyses, additional engine performance calculations and, finally, compilation of the emissions test summary sheet.

4.2 DATA CORRECTION FACTORS

The EPA Parameter (EPAP) is defined (Reference 1) as the total mass emitted of a particular gaseous pollutant per unit engine rated thrust, for a particular EPA designated landing-takeoff cycle. The EPAP for each specie (CO, HC, NO_x) may be calculated from the equation

$$EPAP = \Sigma (EI*F*TIM)/RATED\ THRUST \qquad (1)$$

where the summation is over the five EPA specified power settings, EI is the emission index, F is the fuel flow rate, and TIM is the "time-in-mode" for each power setting. The EPAP is usually expressed in units of grams per kilonewton thrust per cycle. In this report the EPAP is expressed in

engineering units of pound per 1000 pound thrust per cycle in order to maintain consistency in units.

In Equation 1, the engine rated thrust is taken as the nameplate value, as discussed in the previous section. TIM is specified (Reference 1) for each mode as 19.0, 0.7, 2.2, 4.0, and 7.0 minutes, respectively, for idle (out), takeoff, 85 percent, 30 percent, and idle (in) power settings. The remaining factors in Equation 1, EI and F for each mode, are obtained from test data. Since ambient conditions of temperature, pressure, and humidity are known to affect both the engine emissions and the engine performance parameters (such as fuel flow), it is important to correct the test data for these effects. This is especially true in a program such as that reported here, where factors affecting engine to engine variability must be controlled as much as possible.

There have been two different approaches used in correcting emissions data for ambient effects. One approach is to select correction factors based solely on the ambient conditions. The other method is to determine correction factors based on the deviation of combustor inlet conditions from some reference values, generally obtained from the engine status cycle. This latter approach is now more commonly employed and has been recommended in several recent studies (References 2, 3, 4) sponsored by both the EPA and FAA.

The emissions correction factors used in the present program are based on parametric studies previously made by General Electric on CF6-type combustion systems. The correction factors involve combustor inlet conditions of pressure (P_3), temperature (T_3), and humidity (HUM). The magnitude of each factor depends on the deviation of the actual test value from the reference level for each pollutant at each power setting. The general equation for the emission index (EI) corrections along with the constants employed in the equation is given in Table 1. Note that the signs of the constants in the equation are such as to indicate the direction of change of EI with the measured parameter. For example, EICO decreases with increasing P_3 so that the constant "a" is negative for CO. However, EINOX increases with increasing P_3 so that "a" is positive for NO_x.

The EPA standard document (Reference 1) does not address the question of correction of the measured engine fuel flow, although it is clear, from Equation 1, that the EPAP is proportional to the measured fuel flows. Since fuel flow varies significantly with ambient conditions and since measured EI's and thrust are corrected for ambient conditions, it seems logical that the measured fuel flow should be likewise corrected. The fuel flow correction factor is that normally used at General Electric for CF6 engine performance analysis and is given in Table 1. This fuel flow correction factor accounts for variation in ambient pressure, temperature, and humidity, but is based on the actual power setting. The EI correction factors, however, adjust the measured EI's to reference day engine parameters (T_3 and P_3). Thus the EI correction procedure effectively corrects for inexact engine power setting along with ambient effects, while the fuel flow is corrected only for ambient conditions.

4.3 DATA ACQUISITION AND REDUCTION

The important test parameters were tabulated on the CF6 engine emissions test summary sheets, which are the output of the CF6-SUMM computer program. These summary sheets for the entire test program are given in Appendix A (CF6-50C2 model engine with JP-4 fuel), Appendix B (CF6-50C2 model engine with Jet A fuel), and Appendix C (CF6-6D model engine with Jet A fuel). There are two summary sheets for each engine tested, the first giving emissions data from rake A (FAA diamond pattern), and the second listing emissions data from rake B (EPA cruciform pattern). Also included in Appendix A is a list of nomenclature for the test summary sheet.

Each summary sheet is divided into four sections. The first section lists engine performance data for each of the power settings. These data are the same for both the A and B sample patterns. The engine performance data are obtained mainly from the test cell digital data reduction tabulation, although some of the parameters are separately computed. The main engine flow is computed from the high pressure turbine flow function.

Table 1. EMISSION INDEX AND FUEL FLOW CORRECTION FACTORS FOR CF6 MODEL ENGINES.

General Equation (applies to CO, HC, NO_x):

$$EIK = EI\left(\frac{P_3RF}{P_3}\right)^a \exp\left[\left(\frac{T_3RF-T_3}{b}\right) + c(HUMRF-HUM)\right]$$

	Constants in General Equation		
	a	b	c
EICOK	-0.5	-400	0
EIHCK	0	-140	0
EINOXK	0.37	490	-0.00269

Corrected Fuel Flow:

$$WFEK = WFE\ (1-0.0000691\ HUM)/\delta\theta^{.54}$$

$\delta = P_2/14.696$

$\theta = (T_2+459.67)/518.67$

Nomenclature:

P_3 psia - combustor inlet pressure

P_3RF, psia - reference combustor inlet pressure

T_3, ^{o} F - combustor inlet temperature

T_3RF, ^{o} F - reference combustor inlet temperature

HUM, gr/lb - ambient humidity

HUMRF, gr/lb - reference humidity

P_2, psia - engine inlet total pressure

T_2, ^{o} F - engine inlet total temperature

EPA Specified Reference Day Ambient Conditions:

P_2 = 14.696 psia

T_2 = 59° F

HUMRF = 44 gr/lb

The second section of the summary contains emissions data which are obtained from separate computer programs for smoke and gaseous emissions. Calibration data for the CO, CO_2, HC, and NO_x analyzers are input to the CALIB program which fits the data to a preselected analytical function. The calibration function is then used with the emissions test data to obtain the gaseous concentrations through the CAROL program. The CAROL program also calculates emission indices, fuel-air ratio, and combustion efficiency from the gaseous concentrations. Equations used to calculate emission indices and fuel-air ratio are taken from SAE Recommended Practice (Reference 5). Smoke data is processed through a computer program which reduces the data in accordance with the EPA specified (Reference 1) procedures.

The third section of the summary tabulation contains the corrected emissions data, based on reference values of T_3, P_3, and HUM which have been obtained from the engine status cycle. The correction procedure is outlined in Table 1.

The last section in the test summary contains EPAP values calculated from Equation 1 using the corrected EI and fuel flow, obtained as indicated in Table 1. The last item on the summary sheet is the maximum smoke number. The maximum smoke number measured at any of the five power settings is the parameter controlled by EPA regulations. The EPAP values are tabulated both in engineering units and in metric units.

4.4 EMISSIONS TEST DATA

The three separate engine test series were conducted between April 10 and December 5, 1979. Overall, the data spanned a wide range of ambient temperature and humidity, with T_2 variation from 27 to 88° F, and humidity variation from 19 to 105 grains per pound. In each test, five separate engine test points were run and emissions were measured separately from rake A (diamond pattern) and rake B (cruciform pattern). It might be noted that the NO_x emission index obtained in the test of ESN 517-539 is about 35 percent lower than the average. This was a test of the CF6-50C2 engine on JP-4 fuel. Since this is well outside of normal statistical variation in the data, the NO_x data from this test is not included in any of the

averages presented in this report. It is strongly suspected that, on this particular test, zero gas was leaking into the NO_x sample system, thus causing the low values.

Although emissions were normally measured at only five power settings, some additional data points were obtained for one CF6-50C2 engine and for one CF6-6D engine, both on Jet A fuel. Plots of EI versus combustor inlet temperature (T_3) for these two tests are given in Figures 9 through 14. These data were plotted against T_3 since, in general, the EI is more sensitive to T_3 than to other engine parameters. The plots contain the actual uncorrected EI for each of the test points for each of the sampling patterns. These Figures show the general trends of emissions with T_3 and the generally good agreement between samples from the two different sampling rakes. Also indicated in these plots is that EPAPCO and EPAPHC values are mainly determined by the idle emissions levels, while EPAPNOX is mostly determined by the high power (takeoff and 85 percent) test points.

Figure 15 is a plot of measured CO and HC emissions at idle power for the CF6-50C2 engines on JP-4 and Jet A fuels for the Rake A (diamond pattern) only. Note that the cold idle (initial test point) is distinguished from the hot idle (final test point). These plots indicate the total range of measured CO and HC and show the trend of idle emissions with T_3. These data also show idle emissions for Jet A fuel to be somewhat higher than for JP-4 fuel, and that emissions of both CO and HC tend to be slightly higher for the hot idle condition than for the cold idle condition. This latter effect is thought to be due to the fact that combustor fuel-air ratio is lower for the hot idle condition, which would cause an increase in both CO and HC emissions.

Figure 16 shows measured NO_x emission index versus T_3 at takeoff and 85 percent power for the CF6-50C2 engines on JP-4 and Jet A fuels for the rake A (diamond pattern) only. The spread in these data is mainly due to differences in humidity from test to test. The humidity is indicated on the Figure for each of the engines. The higher humidity causes reduced NO_x emissions.

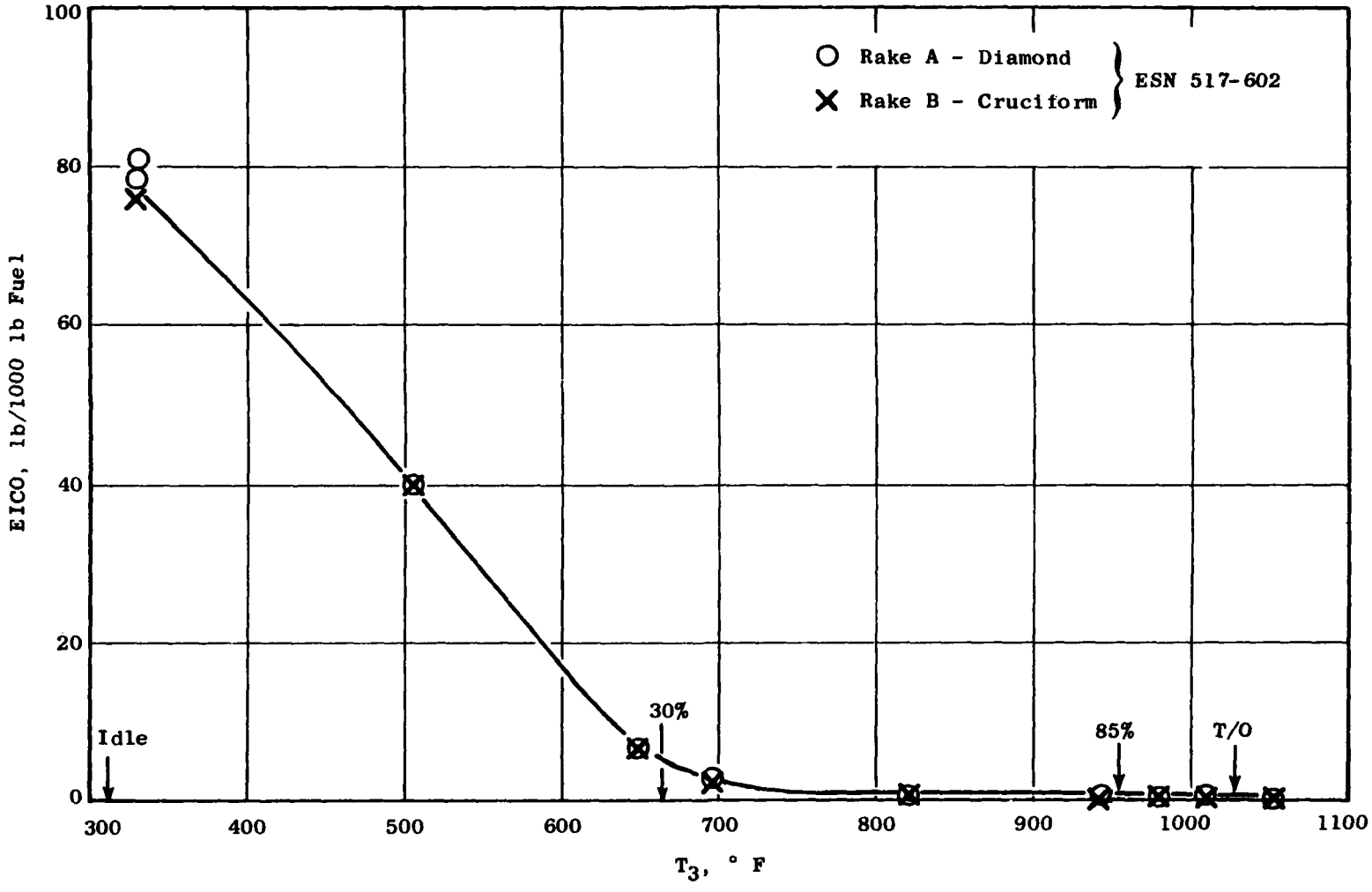


Figure 9. Measured CO Emission Index Vs. T_3 for a CF6-50C2 Engine on Jet A Fuel.

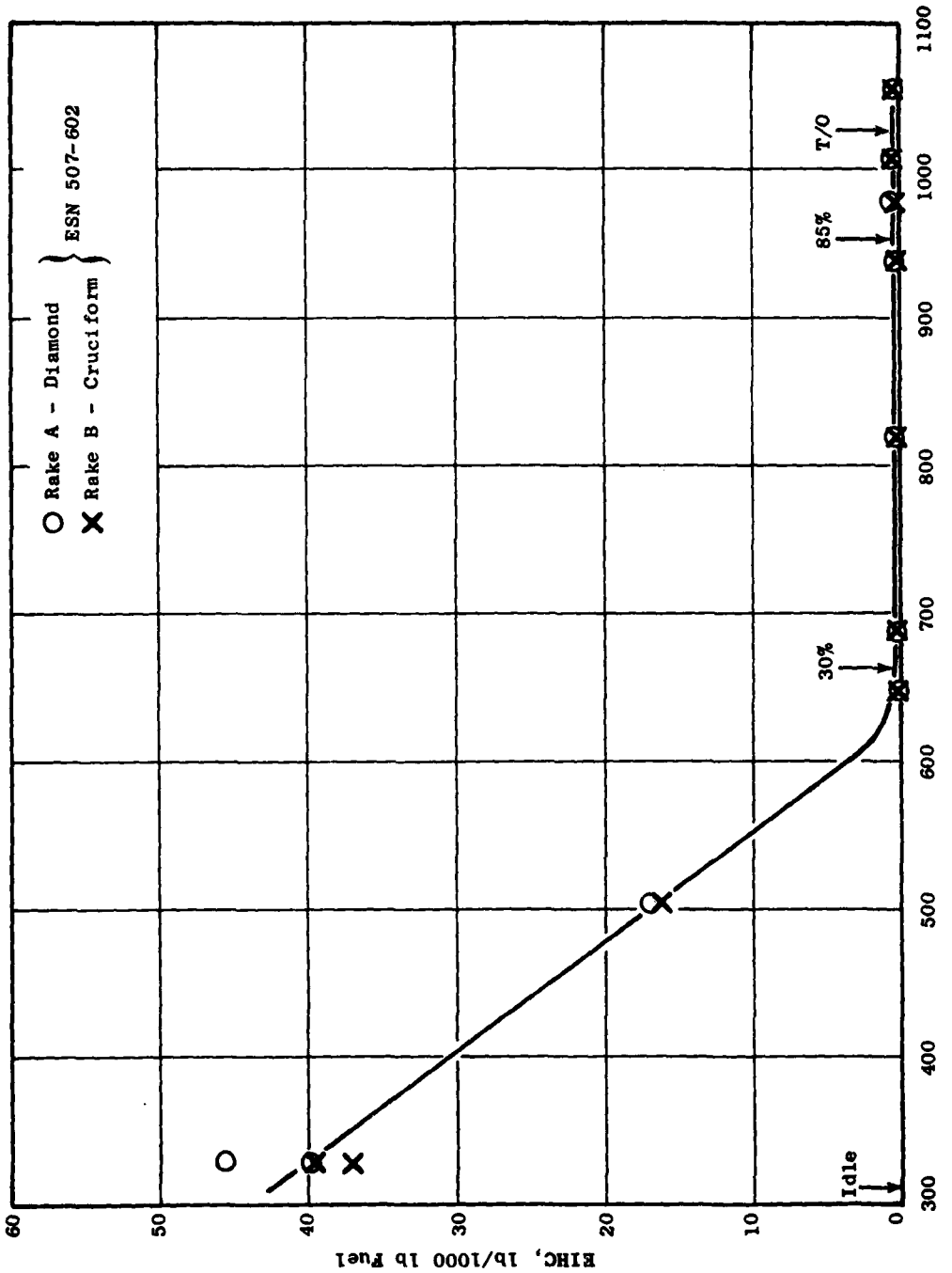


Figure 10. Measured HC Emission Index Vs. T_3 for a CF6-50C2 Engine on Jet A Fuel.

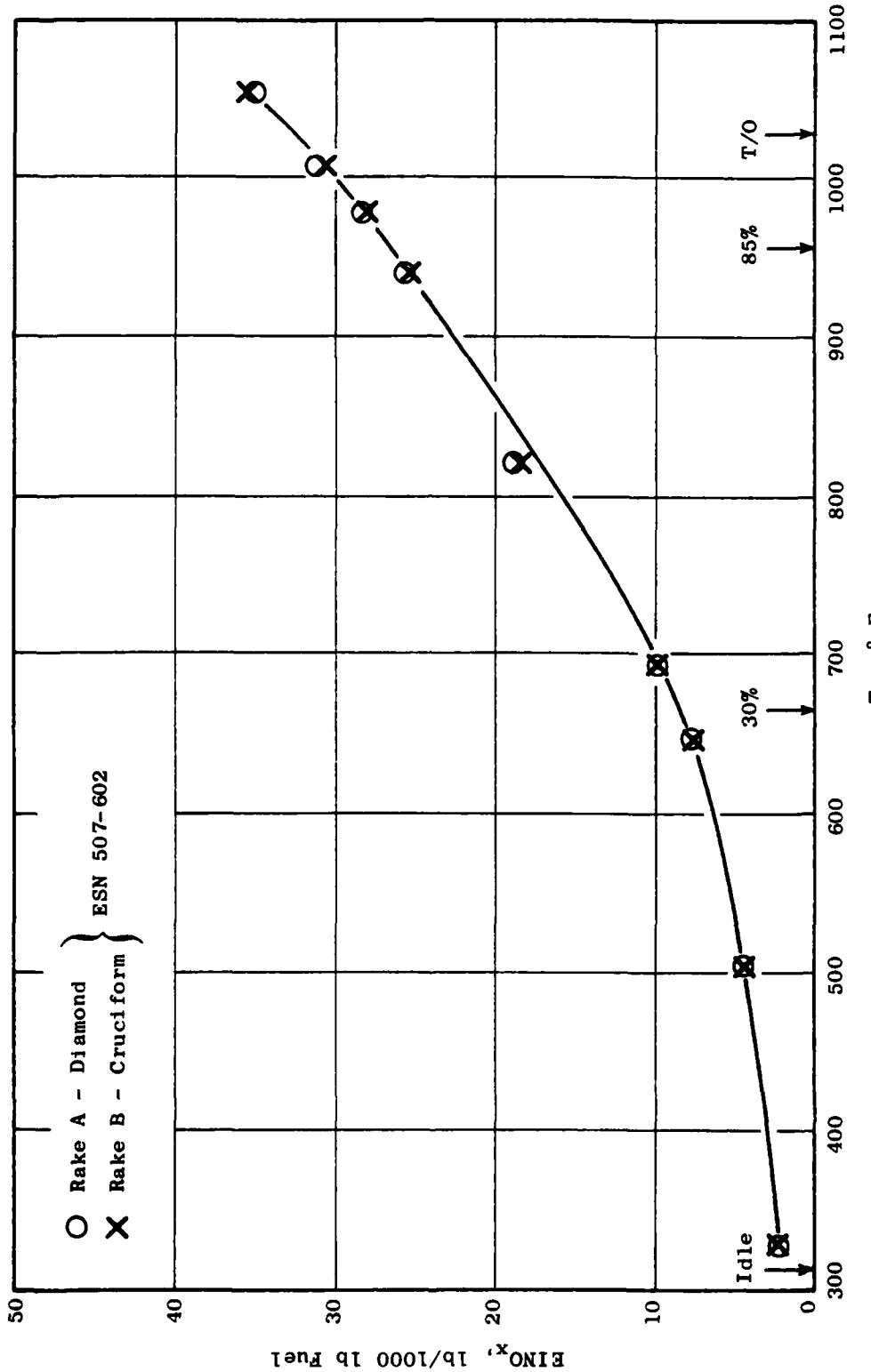


Figure 11. Measured NO_x Emission Index Vs. T_3 for a CF6-50C2 Engine on Jet A Fuel.

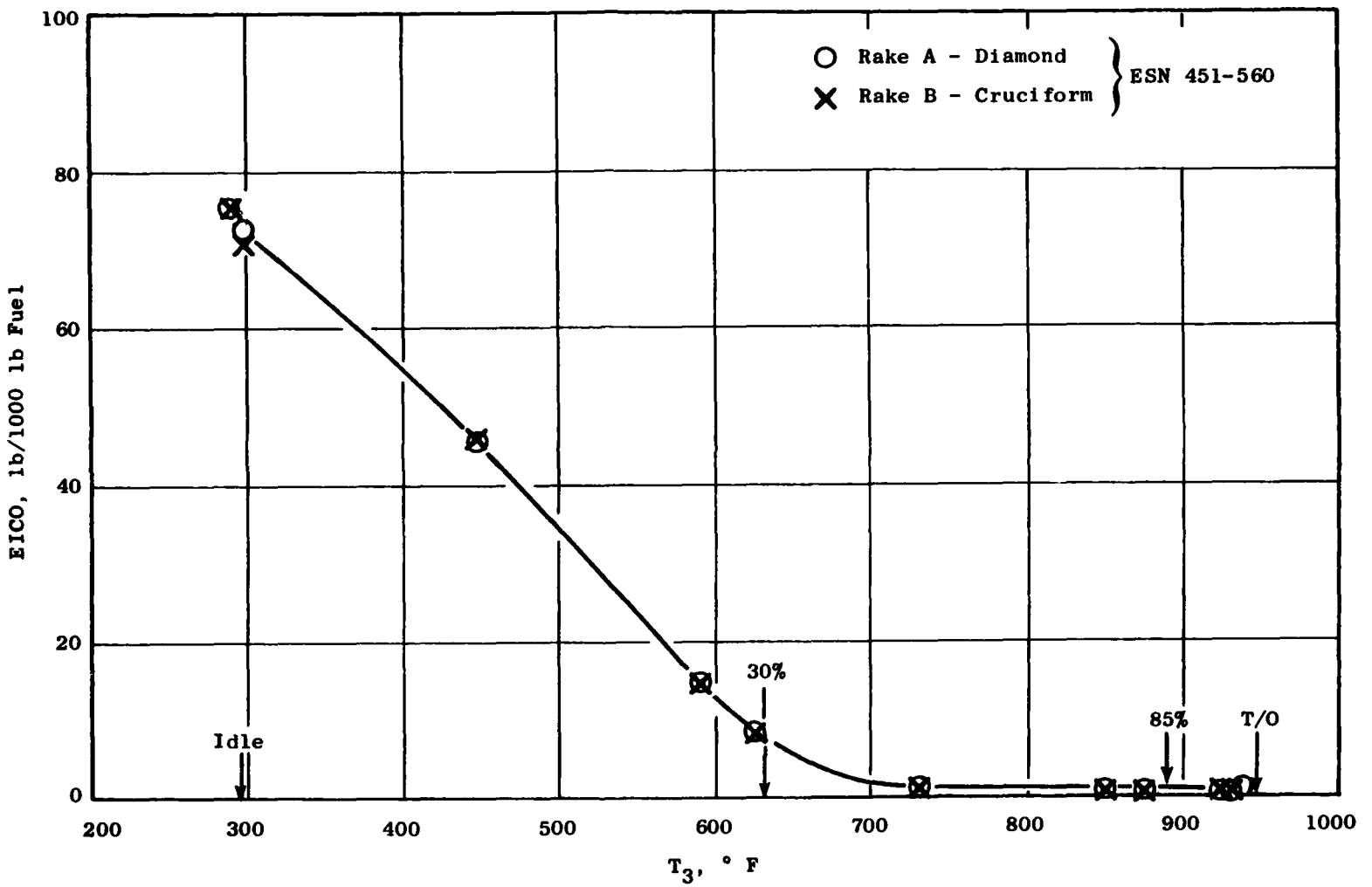


Figure 12. Measured CO Emission Index Vs. T_3 for a CF6-6D Engine on Jet A Fuel.

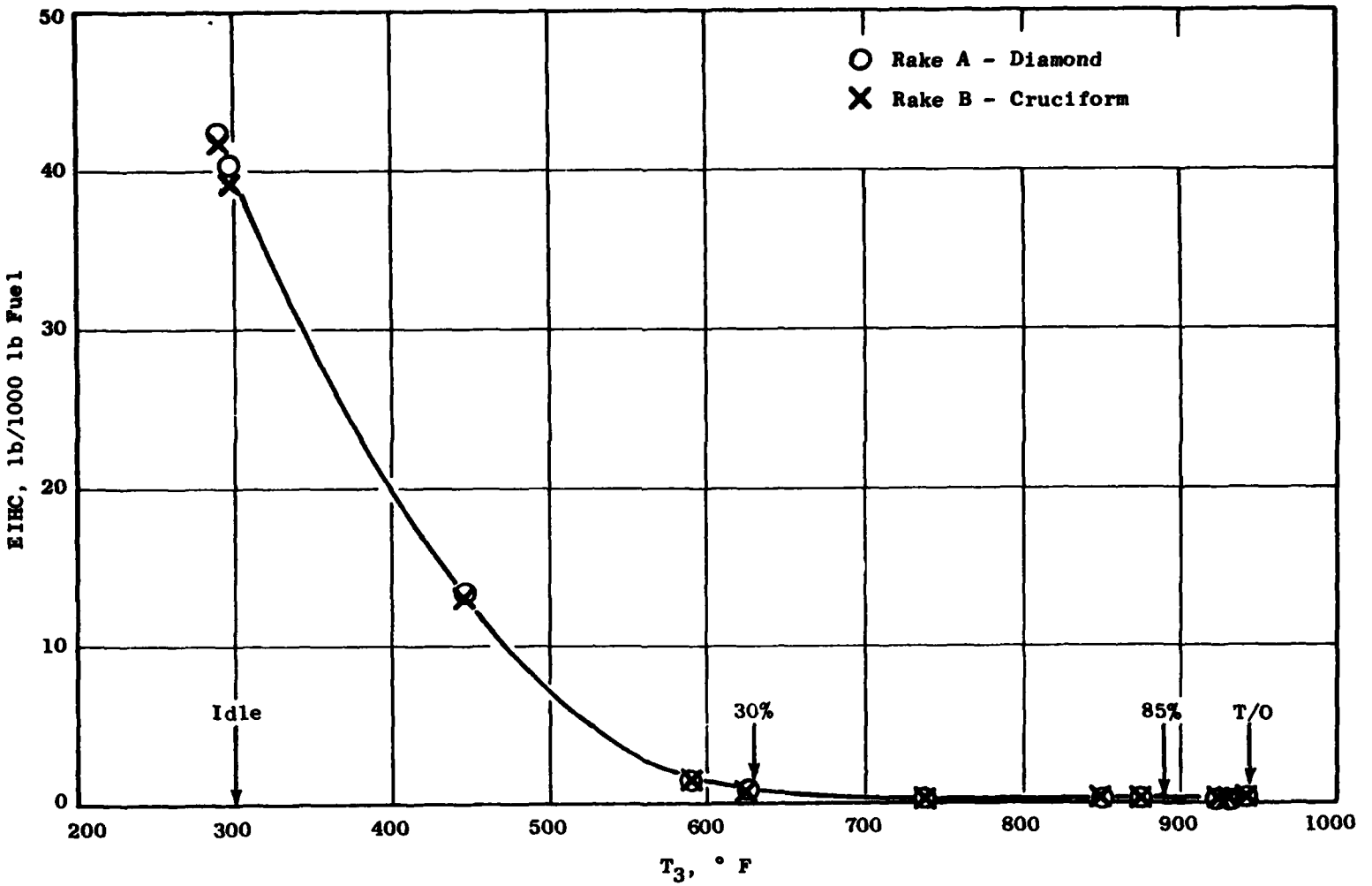


Figure 13. Measured HC Emission Index Vs. T_3 for a CF6-6D Engine on Jet A Fuel.

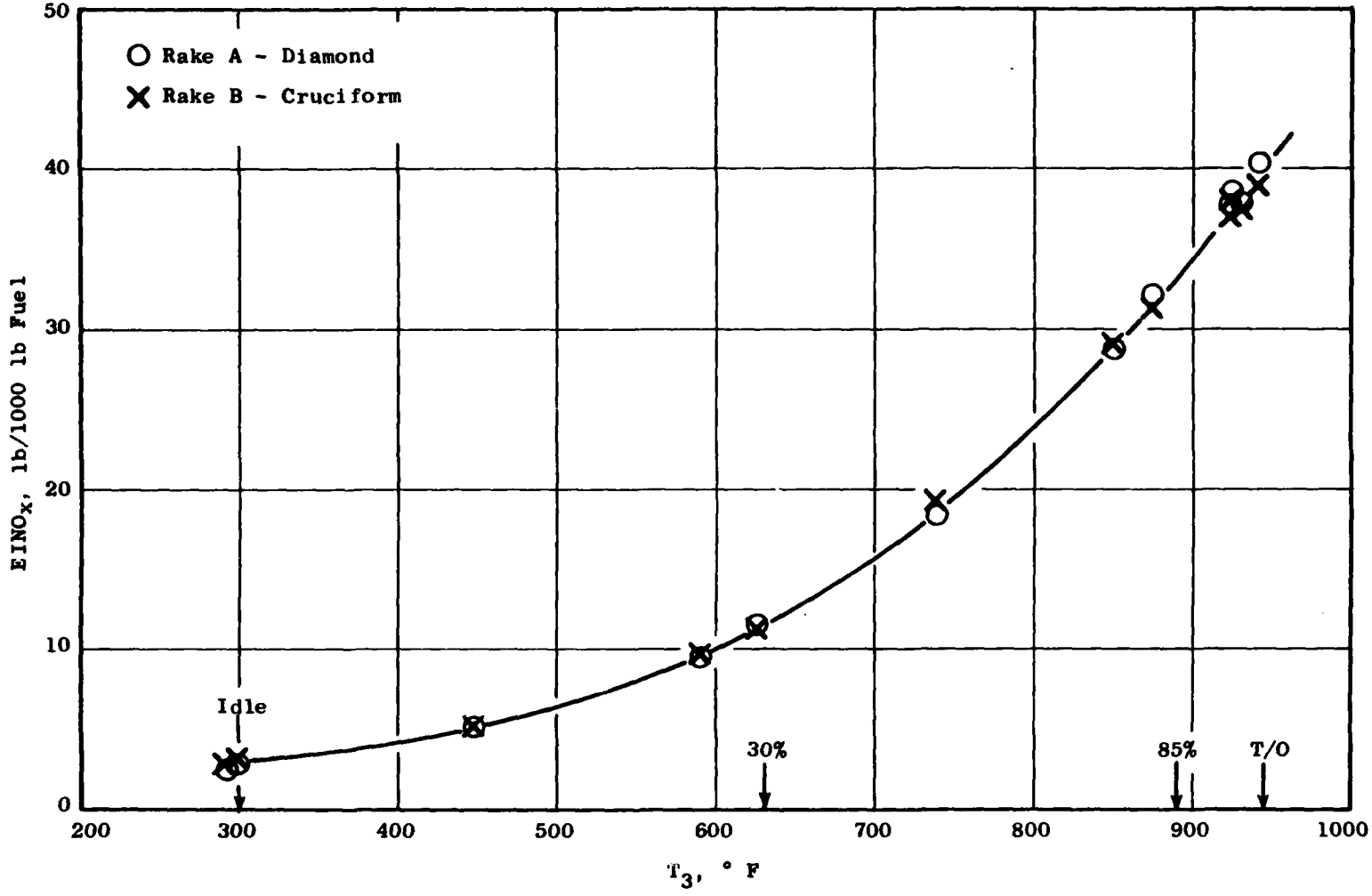


Figure 14. Measured NO_x Emission Index Vs. T_3 for a CF6-6D Engine on Jet A Fuel.

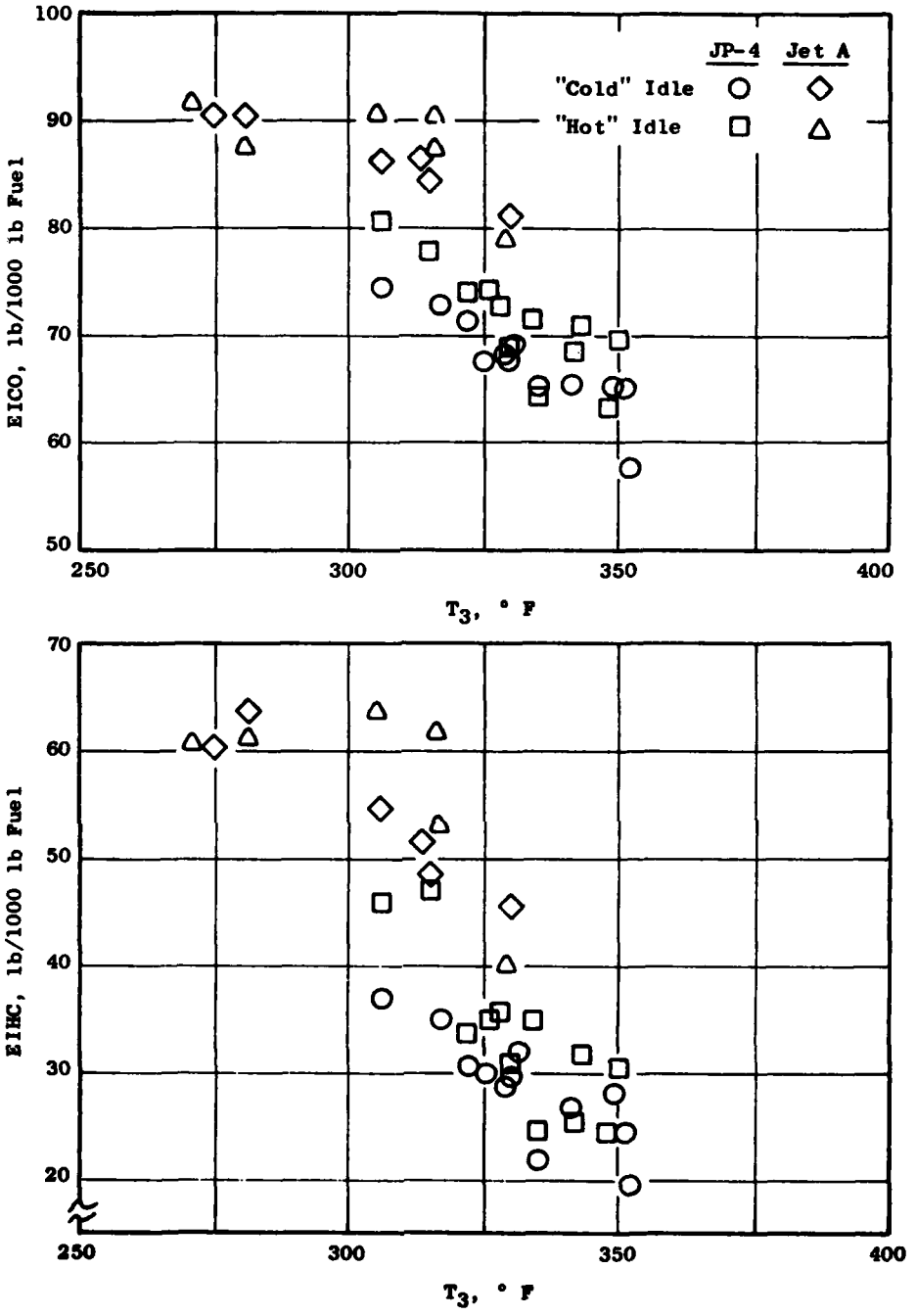


Figure 15. Measured CO and HC Emission Index Vs. T_3 from Rake A (Diamond Pattern) for 18 CF6-50C2 Engines on JP-4 and Jet A Fuels. Both Cold (Initial) and Hot (Final) Idle Readings are Shown.

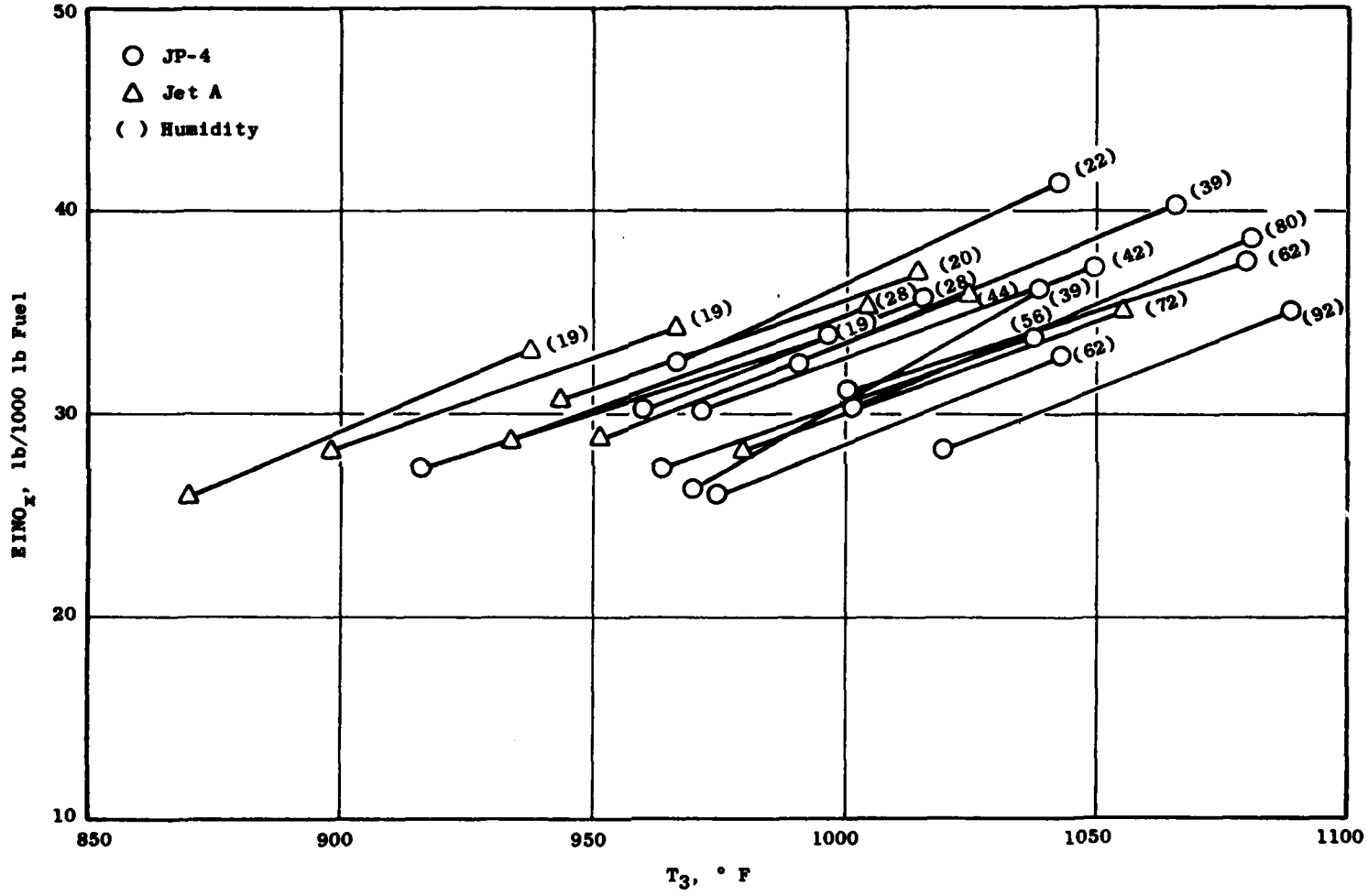


Figure 16. Measured NO_x Emission Index Vs. T_3 from Rake A (Diamond Pattern) for 18 CF6-50C2 Engines on JP-4 and Jet A Fuels at Takeoff and 85% Power Levels.

The data plotted in Figures 9 through 16 are measured (uncorrected) EI's, which show fairly strong trends with T_3 and, for EINOX, with humidity. A summary of average corrected EI's for the three test series for each of the sample rakes, and for each of the power settings is presented in Table 2. Also given in Table 2 is the standard deviation and coefficient of variation for each of the values. The coefficient of variation is the standard deviation divided by the average, expressed in percent. As indicated by the relatively small standard deviations in Table 2, the correction factors effectively reduce data variability to rather low levels as compared to the uncorrected data.

The average corrected EI's for CO and HC (from Table 2), are compared in Figure 17 for data from the three test series. The tendency for the diamond rake to yield higher EI's at idle than the cruciform rake, and the tendency for the hot idle condition to give higher EI's than the cold idle condition is graphically illustrated on this bargraph. The higher EI's for Jet A fuel as compared to JP-4, and the higher values for the CF6-50C2 engine compared to the CF6-6D can also be noted in this graph. The data variability ($\pm$ one standard deviation spread) is marked on each bar in Figure 17.

The average corrected EINOX values for each test series are compared in Figure 18 for each of the three highest power levels. For NO_x, the effect of sampling pattern on the corrected levels is negligible, and the fuel effect is quite small, compared to the corresponding effects on CO and HC.

As noted above, there is generally little difference between average emission indices obtained with the diamond rake and the cruciform rake, although for CO and HC, the level tends to be slightly higher with the diamond rake. The physical difference in the two patterns is that the diamond rake samples at but one radial location (at 63 percent of the nozzle radius) while the cruciform rake samples at three radial locations, spaced roughly on centers of equal areas. In Figures 19 and 20, the ratio of fuel-air ratio calculated from gas analysis (FARGAS) to the fuel-air ratio calculated from engine parameters (FAR8) is plotted against FAR8 for both the diamond rake and the cruciform rake. Figure 19, for the

Table 2. AVERAGE CORRECTED EMISSION INDICES FOR THREE TEST SERIES.

			(6) CF6-50C2 Jet A Fuel			(12) CF6-50C2 JP-4 Fuel			(7) CF6-6D Jet A Fuel		
Index	Power	Rake	Avg.	Std. Dev.	CV%	Avg.	Std. Dev.	CV%	Avg.	Std. Dev.	CV%
EICOK	Cold Idle	A	83.23	0.93	1.1	70.26	3.13	4.5	73.88	5.93	8.0
	Cold Idle	B	80.83	1.97	2.4	69.46	3.07	4.4	74.10	5.58	7.5
	Hot Idle	A	84.56	4.02	4.8	74.28	3.54	4.8	76.55	6.79	8.9
	Hot Idle	B	82.73	2.98	3.6	72.22	3.28	4.5	75.49	5.40	7.2
	T/O	A	0.53	0.15	28.1	0.18	0.12	68.7	0.51	0.12	22.8
	T/O	B	0.49	0.15	30.4	0.17	0.11	64.7	0.51	0.12	22.8
	85%	A	0.52	0.16	30.9	0.16	0.12	78.9	0.51	0.11	22.0
	85%	B	0.52	0.12	24.0	0.14	0.11	75.3	0.51	0.11	22.0
	30%	A	5.81	2.38	41.0	3.26	1.03	31.5	6.78	1.92	28.3
	30%	B	5.66	2.23	39.3	3.14	0.98	31.2	6.53	1.92	29.5
EIHCK	Cold Idle	A	50.58	2.26	4.5	32.77	3.58	10.9	39.07	4.56	11.7
	Cold Idle	B	48.84	2.57	5.3	32.85	3.63	11.1	39.44	3.95	10.0
	Hot Idle	A	53.04	7.76	14.6	37.83	5.43	14.4	41.26	5.86	14.2
	Hot Idle	B	50.55	6.61	13.1	35.84	4.73	13.2	40.54	3.87	9.6
	T/O	A	0.65	0.22	33.8	0.28	0.22	80.3	0.27	0.23	85.7
	T/O	B	0.64	0.23	36.4	0.30	0.25	83.5	0.25	0.25	97.3
	85%	A	0.68	0.27	40.3	0.33	0.31	94.8	0.20	0.29	146.9
	85%	B	0.66	0.26	40.1	0.32	0.32	102.3	0.27	0.28	103.5
	30%	A	1.02	0.42	41.6	0.60	0.66	111.1	0.65	0.51	78.5
	30%	B	0.97	0.44	45.7	0.60	0.67	111.6	0.68	0.46	68.4
EINOXK	Cold Idle	A	2.37	0.07	2.8	2.44	0.19	7.8	2.74	0.18	6.5
	Cold Idle	B	2.42	0.14	5.9	2.47	0.18	7.4	2.76	0.18	6.3
	Hot Idle	A	2.43	0.12	4.8	2.42	0.18	7.5	2.81	0.23	8.3
	Hot Idle	B	2.48	0.11	4.4	2.46	0.17	6.8	2.84	0.22	7.7
	T/O	A	36.39	0.61	1.7	35.71	1.50	4.2	40.14	1.95	4.9
	T/O	B	36.51	0.55	1.5	35.69	1.46	4.1	39.97	1.72	4.3
	85%	A	29.28	0.40	1.4	28.43	1.61	5.7	32.51	1.06	3.3
	85%	B	29.63	0.77	2.6	28.39	1.76	6.2	32.64	0.83	2.5
	30%	A	9.67	0.62	6.5	10.35	0.51	4.9	11.37	0.48	4.2
	30%	B	9.65	0.67	6.9	10.42	0.50	4.8	11.44	0.46	4.0

CV% = 100 x Std. Dev./Avg.

Rake A - Diamond Pattern

Rake B - Cruciform Pattern

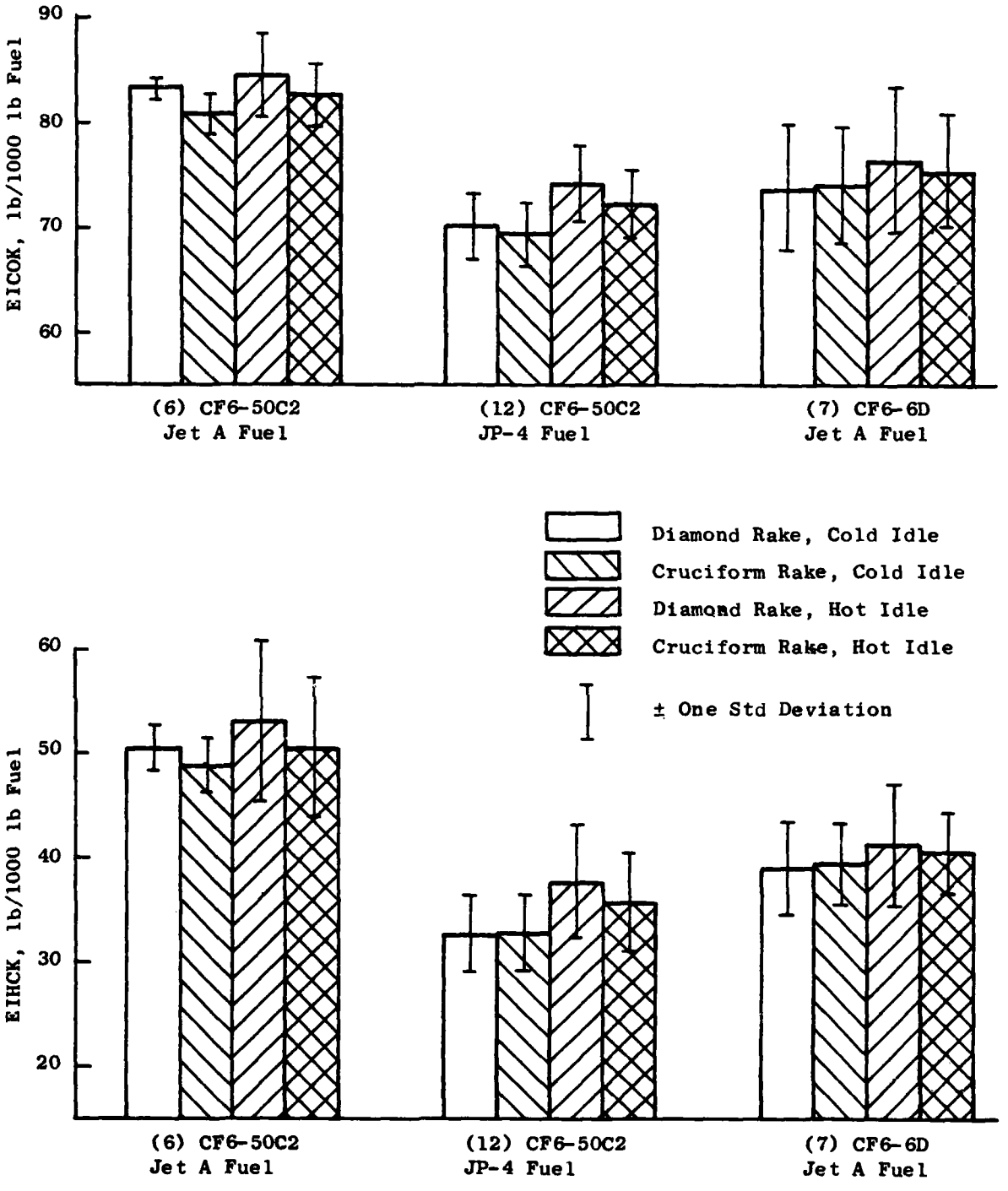


Figure 17. Average Corrected CO and HC Emission Indices at Idle Power for Three Emission Test Series.

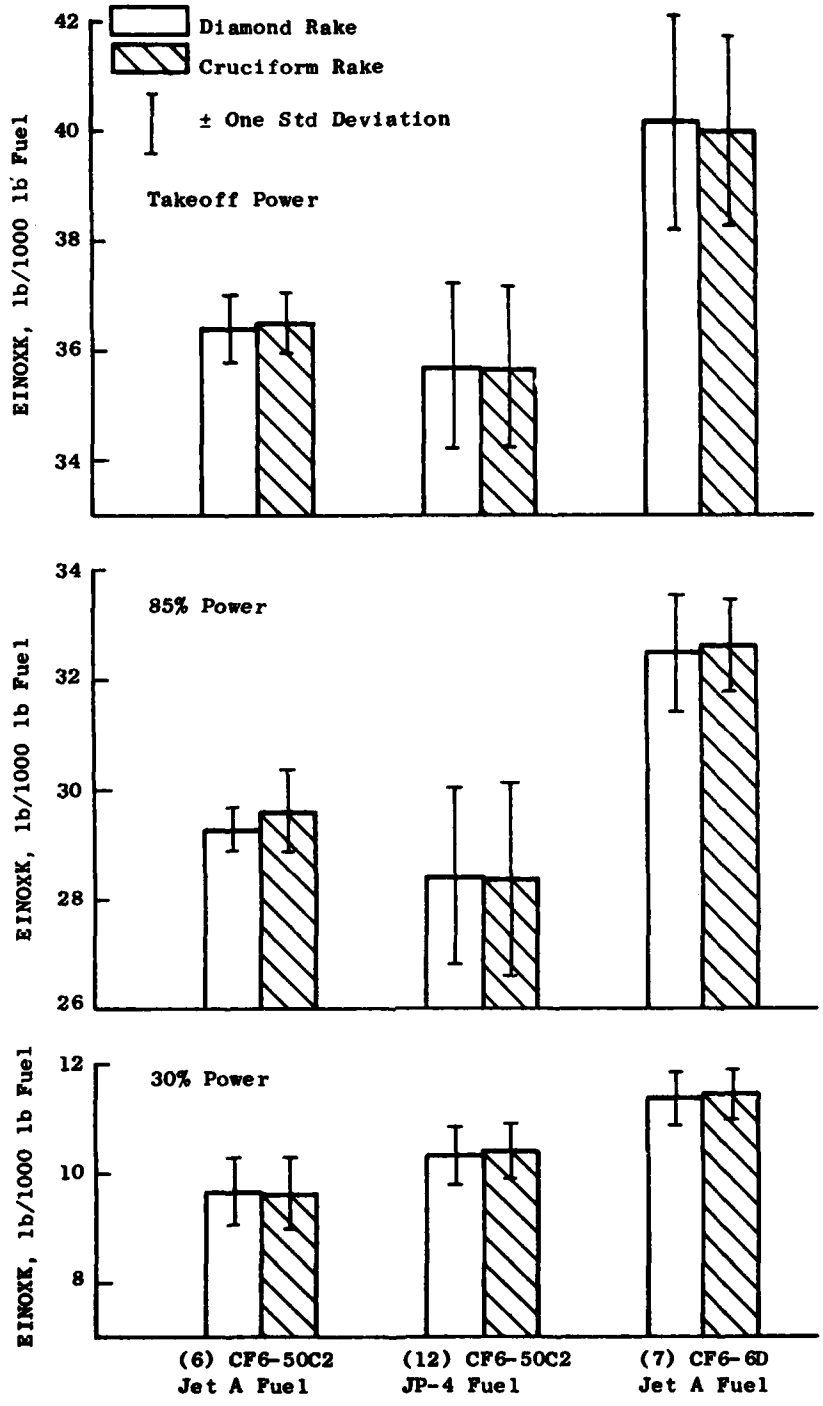


Figure 18. Average Corrected NO_x Emission Index at Takeoff, 85%, and 30% Power Levels for Three Emission Test Series.

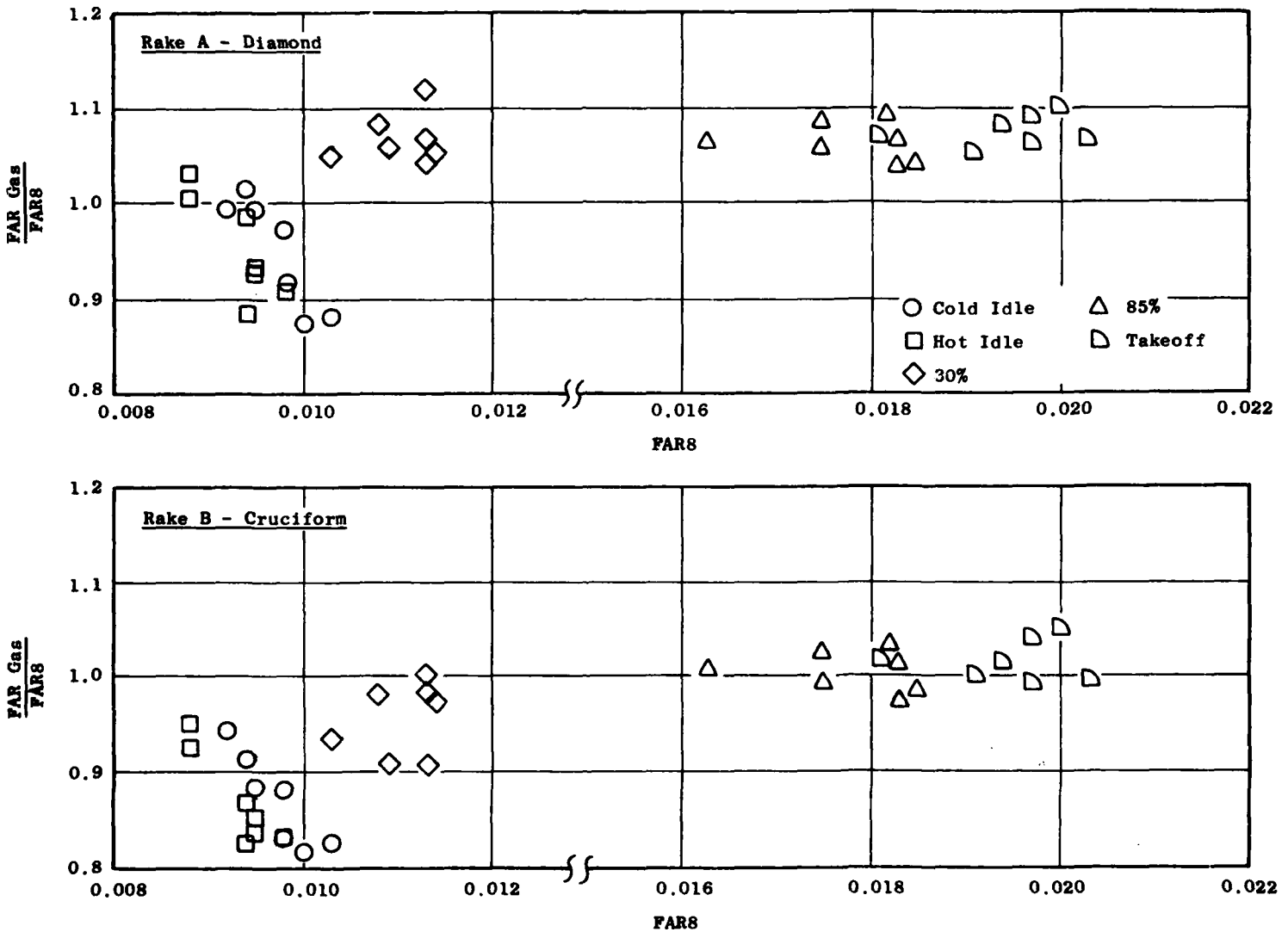


Figure 19. Ratio of Fuel-Air Ratio from Gas Analysis (FARGAS) to Fuel-Air Ratio Calculated from Engine Parameters (FAR8) Plotted Against FAR8 for Seven CF6-6D Engines on Jet A Fuel. Comparison of Rake A (Diamond Pattern) and Rake B (Cruciform Pattern).

CF6-6D engines, shows good agreement in fuel-air ratios (ratio near 1) at high power levels for the cruciform rake, while the diamond rake gives higher fuel air ratios at the high power levels. At idle power, gas samples from both rakes give lower fuel-air ratios than the value calculated from engine parameters. Fuel-air ratios from the diamond rake tend to be higher than from the cruciform rake since it samples near the center of the slightly peaked radial fuel-air profiles. Figure 20 is a similar plot for the CF6-50C2 engines on JP-4 fuel. For these engines, somewhat better agreement between measured and calculated fuel-air ratios is obtained, and also better agreement between samples from the two rakes.

Smoke levels were extremely low in all three test series. These levels were typically between 2 and 6 smoke numbers. Due to the insensitivity of the smoke measurement method, any trends in the data would be extremely difficult to detect at these low levels. Average smoke number at each thrust level for the three test series is shown in Figure 21, with the standard deviation indicated on each data point. As may be noted in this plot, the only appreciable trend appears to be the slightly lower smoke level with JP-4 fuel.

Analysis of a fuel sample was made for each of the engines tested. Table 3 lists results of the JP-4 analyses and Table 4 lists results of the Jet A analyses. All analyses were performed in the Evendale Plant fuels lab by standard analytical methods. Specific gravity was measured by the hydrometer method (ASTM D 1298), net heat of combustion by precision bomb (ASTM D 2382), hydrogen by the lamp method (ASTM D 1018), sulfur by the lamp method (ASTM D 1266), and aromatics and olefins by fluorescent indicator absorption (ASTM D 1319). As can be seen in Tables 3 and 4, there is very little variation in fuel properties of a particular fuel over the time period of these tests, and the effect on emissions variation is insignificant.

As noted previously, the corrected EI's for CF6-50C2 engines with Jet A fuel were significantly higher than with JP-4. CO and HC EI's were about 15 percent and 45 percent higher, respectively, with Jet A. The NO_x EI's were about 3 percent higher with Jet A at the higher power levels. These

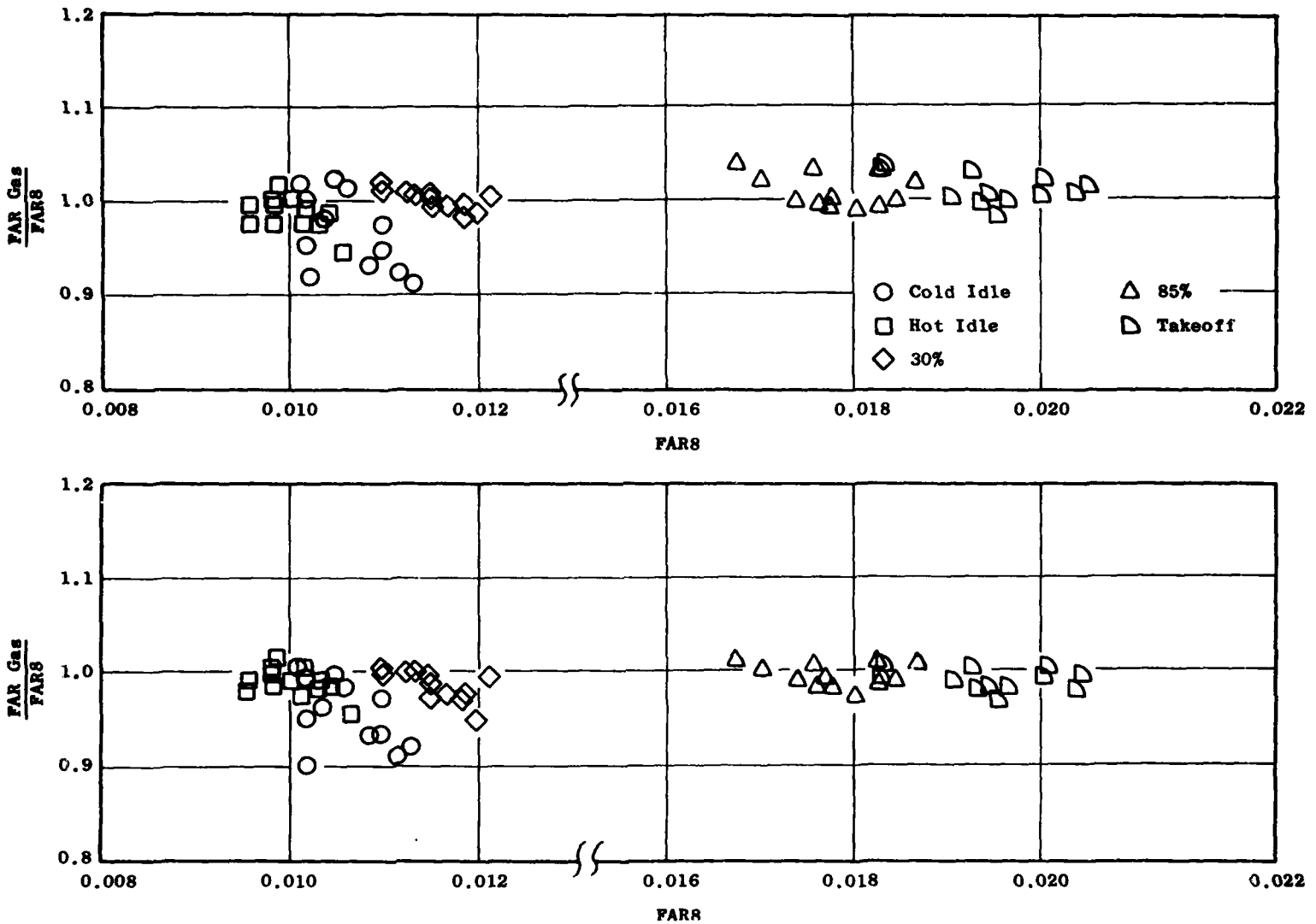


Figure 20. Ratio of Fuel-Air Ratio from Gas Analysis (FARGAS) to Fuel-Air Ratio Calculated from Engine Parameters (FAR8) Plotted Against FAR8 for 12 CF6-50C2 Engines. Comparison of Rake A (Diamond Pattern) and Rake B (Cruciform Pattern).

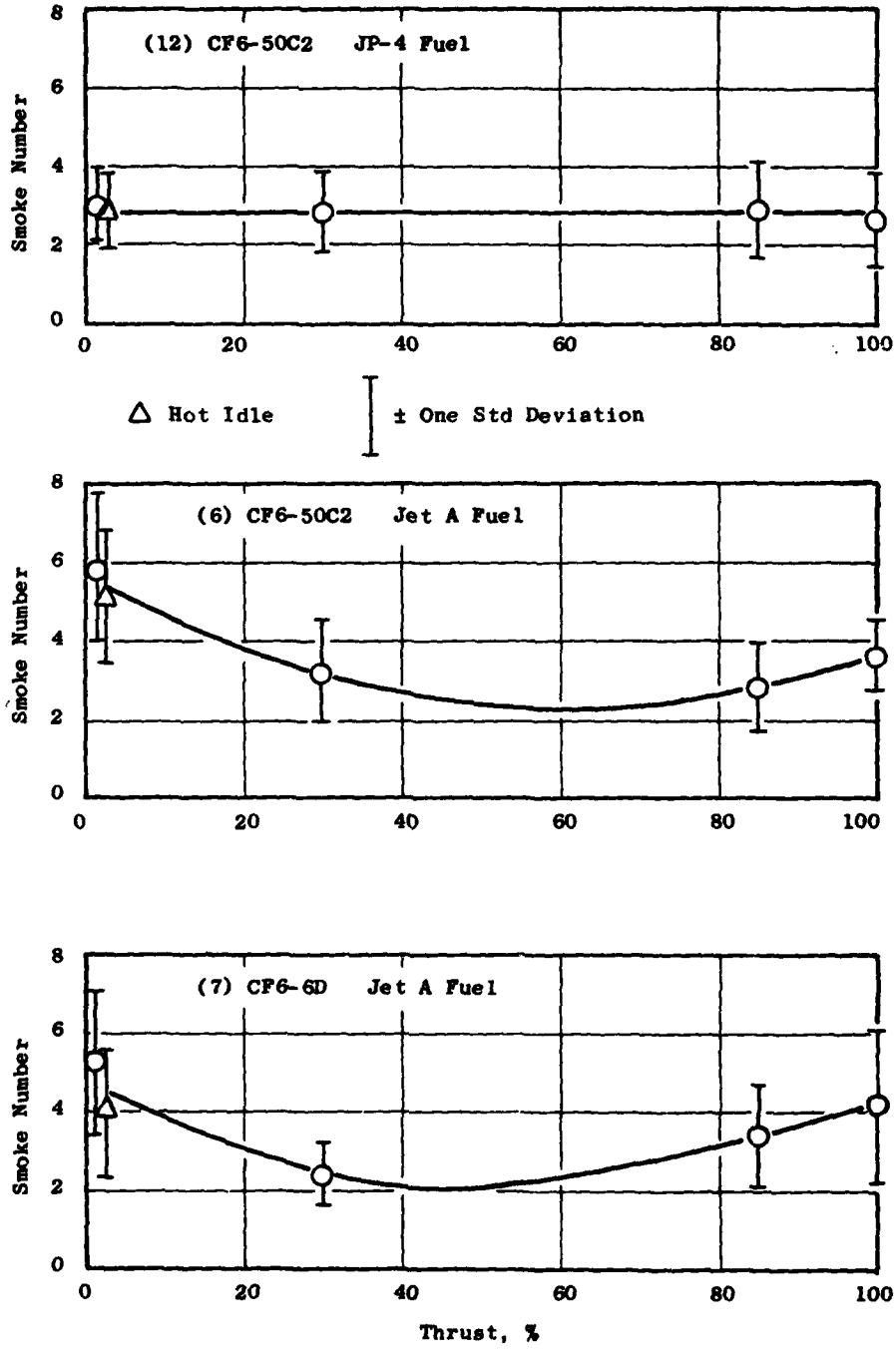


Figure 21. Average Smoke Number at each Thrust Level for Three Engine Test Series.

Table 3. JP-4 Fuel Analyses for CF6-50C2 Production Engine Tests.

Sample Date	Lab No.	Engine No.		Specific Gravity	Net Heat of Combustion (Btu/Lb)	Hydrogen (% by Wt)	Sulfur (% by Wt)
4/10/79	7797	-497		0.7540	18,790	14.58	0.035
4/12	7810	-503		0.7544	18,794	14.57	0.036
4/18	7834	-502		0.7545	18,765	14.52	0.034
4/20	7842	-504		0.7535	18,741	14.52	0.036
5/15	7959	-523		0.7549	18,739	14.50	0.036
5/18	7971	-524		0.7547	18,786	14.30	0.043
6/5	8019	-533		0.7547	18,770	14.55	0.040
6/6	8025	-534		0.7551	18,773	14.52	0.034
6/11	8038	-535		0.7546	18,773	14.50	0.040
6/12	8053	-537		0.7548	18,754	14.58	0.042
6/14	8047	-539		0.7549	18,762	14.52	0.038
6/15	8054	-538		0.7544	18,737	14.61	0.045
			Mean	0.75454	18,765	14.523	0.0383
			Std. Dev.	0.00044	19.6	0.079	0.0037
		Specification MIL-T-5624K	Min.	0.751	18,400	13.6	-
			Max.	0.802	-	-	0.40

Table 4. JET A FUEL ANALYSES FOR CF6-6D AND CF6-50C2 PRODUCTION ENGINE TESTS.

Sample Date	Lab No.	Engine No.	Specific Gravity	Net Heat of Combustion (Btu/lb)	Hydrogen (% by Wt)	Sulfur (% by Wt)	Aromatics (% by Vol.)	Olefins (% by Vol.)
(7) CF6-6 Engines								
08-16-79	8210	451-553	0.8136	18,549	13.82	0.089	19.8	2.3
08-24-79	8244	451-554	0.8133	18,571	13.88	0.085	18.4	1.6
08-28-79	8253	451-555	0.8127	18,557	13.93	0.083	18.9	1.9
10-03-79	8396	451-558	0.8133	18,605	13.96	0.096	19.5	1.2
10-30-79	8474	451-560	0.8134	18,576	13.87	0.085	19.1	1.5
11-13-79	8530	451-562	0.8112	18,607	13.83	0.091	17.4	1.9
11-19-79	8548	451-563	0.8109	18,594	13.84	0.094	17.5	1.8
(6) CF6-50C2 Engines								
10-12-79	8432	517-597	0.8129	--	14.04	0.096	21.8	2.4
10-19-79	8453	517-602	0.8132	--	13.78	0.086	18.6	1.4
10-26-79	8469	517-608	0.8132	--	13.87	0.086	15.1	1.4
11-26-79	8556	517-628	0.8111	18,581	13.85	0.099	15.5	1.3
11-29-79	8573	517-629	0.8111	18,596	13.85	0.104	16.5	1.1
12-05-79	8598	517-635	0.8115	--	13.88	0.101	15.2	1.1
		Mean	0.8126	18,582	13.87	0.092	17.9	1.6
		Std. Dev.	0.0011	20.5	0.067	0.007	2.0	0.4
		CV%	0.1	0.1	0.5	7.6	11.1	27.0
Specification ASTM D 1655-79		Min.	0.8398	18,400	--	--	--	--
		Max.	0.7753	--	--	0.3	2.5	--

trends are consistent with the general effects of fuel properties on emission levels. As explained in a recent report (Reference 6), the higher NO_x level with Jet A is due to the lower hydrogen content and corresponding higher flame temperature. The higher CO and HC emissions are attributed to the poorer atomizing characteristics of Jet A, resulting from higher viscosity and surface tension than JP-4.

The emissions tests were run following the normal factory acceptance test of each engine. The calculated thrust data, from the test series with and without the emissions sampling rake installed, were examined to determine if the presence of the emissions rake actually affected engine operation. For a total of fourteen of the CF6-50C2 engines for which data was compared, the engine thrust with the emissions rake installed was found to be consistently greater than without the rake by an average of + 1.22 percent with extreme values of + 0.35 percent and + 1.80 percent. These differences were determined from corrected thrust versus engine pressure ratio plots, an example of which is shown in Figure 22. The basic cause for this thrust increase with the rake installed is not apparent. It could be due either to a change in actual engine operation by affecting nozzle performance, or by modification of the cell factor as a result of changing cell air flow. The existence of this effect requires that particular care be exercised in the interpretation of engine thrust data obtained with an emissions sampling rake installed. Since in the present emissions test series, the engine power was set by corrected fan speed rather than by corrected thrust, it is believed that this effect on thrust had little if any effect on the emissions measurements.

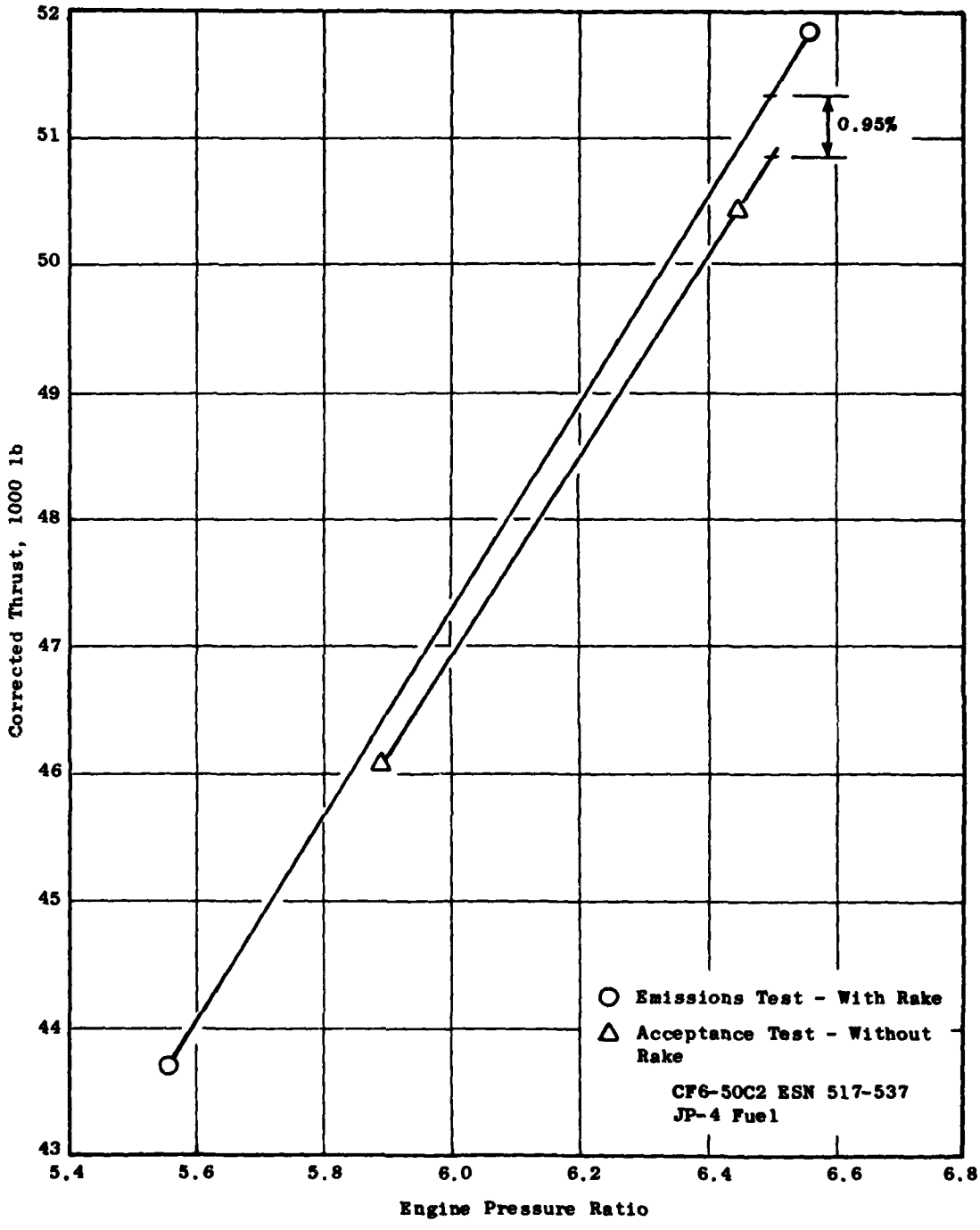


Figure 22. Effect of Emissions Sampling Rake on Corrected Thrust.

5.0 ENGINE EMISSIONS TEST VARIABILITY

A summary of the engine emissions test variability is given in Table 5 where the average EPAP values for each gaseous pollutant is listed along with the standard deviation and coefficient of variation for each of the three engine test series. Also tabulated in Table 5 are corresponding values for the maximum smoke number for each test series. As was noted previously for the emission index, there is a slight tendency for EPAPCO and EPAPHC to be higher for samples taken with the diamond rake. The generally good agreement between data obtained with the two sampling patterns indicates that the exhaust composition of the CF6 engine is radially quite uniform at the sampling plane.

The overall emissions variability found here for these three series of emissions tests on CF6 production engines is somewhat less than has been reported for other engine models (Reference 7). The gaseous emissions data for the CF6-50C2 test series on Jet A fuel is particularly low, although there is no apparent reason for this unusually ordered set of data. It is considered that the variability data from the other two test series are more typical of the data obtained in a random test series on CF6 production engines. For purposes of discussion here, typical values for coefficient of variation for the CF6 are considered to be 6 percent for EPAPCO, 12 percent for EPAPHC, and 4 percent for EPAPNOX.

It should be noted that the variability data obtained in the present study apply to current production CF6 engines which do not meet the proposed gaseous emissions standards. In order to just meet the proposed standards, the average EPAPCO must be reduced to about 40 percent of its present value, EPAPHC to about 12 percent of its present value, and EPAPNOX to about 55 percent of its present value. It has not been demonstrated that the coefficient of variation values measured at the higher EPAP levels of current engines will also apply to engines having emissions reduction features sufficient to meet the proposed standards. It might reasonably be expected that the relative standard deviation (coefficient of variation) would be significantly higher at EPAP levels low enough to comply with the proposed standards.

The variability of the data obtained in production engine tests, such as reported here, is due to three factors. First, engine-to-engine variability arises from actual differences in operation of nominally identical engines. Second, variability also results from the emissions sampling and measurement system. Third, uncertainty is introduced by the relatively large ambient condition correction factors. Although no actual data is presented as to the relative contributions of each of these variability sources, it is believed that, in the present test series, significant variability was introduced by each of the three factors.

Table 5. SUMMARY OF EPA PARAMETERS AND VARIABILITY FOR THREE CF6 ENGINE TEST SERIES.

	(12) CF6-50C2 JP-4 Fuel			(6) CF6-50C2 Jet A Fuel			(7) CF6-6D Jet A Fuel		
	Avg.	Std. Dev.	CV%	Avg.	Std. Dev.	CV%	Avg.	Std. Dev.	CV%
EPAPCO, lbm/1000 lbf									
Diamond Rake	0.796	.044	5.5	0.980	.027	2.8	0.854	.073	8.5
Cruciform Rake	0.782	.044	5.6	0.954	.045	4.7	0.851	.067	7.8
EPAPHC, lbm/1000 lbf									
Diamond Rake	0.378	.049	12.9	0.588	.030	5.1	0.434	.054	12.4
Cruciform Rake	0.373	.049	13.2	0.567	.037	6.6	0.436	.046	10.5
EPAPNOX, lbm/1000 lbf									
Diamond Rake	0.556	.027	4.9	0.567	.009	1.5	0.613	.024	4.0
Cruciform Rake	0.556	.028	5.0	0.572	.005	0.9	0.614	.021	3.4
Max. Smoke Number									
Diamond Rake	4.0	.5	13.4	5.7	1.7	30.0	5.8	1.9	33.0
Cruciform Rake	4.0	.7	17.4	6.5	1.5	23.0	5.1	2.2	43.0

CV% = 100 x Std. Dev./Avg.

6.0 CONCLUSIONS

The following are significant conclusions resulting from current CF6 production engine emissions tests conducted on this program:

1. Typical variability (coefficient of variation) in EPA parameters for CF6 engines is 6 percent for CO, 12 percent for HC, 4 percent for NO_x and 2 smoke numbers for smoke. These values are generally less than values previously reported for other engines. The variability data apply to current production engines but do not necessarily apply to future engines with gaseous emissions low enough to meet the proposed EPA standards.
2. For the CF6 engines tested on this program, there are but minor differences in emissions obtained with the FAA diamond sampling patterns as compared to the EPA cruciform pattern.
3. Higher emissions of CO, HC, NO_x and smoke are obtained with Jet A fuel, as compared to JP-4 fuel. These fuel effects are consistent with data recently obtained at General Electric on other programs.
4. There can be small but measurable differences in idle emissions levels obtained on a cold engine and on a hot engine (EPA specified idle out and idle in conditions). The hot idle tends to give higher and more variable emissions levels.
5. The presence of the emissions sampling rake behind the engine in these tests caused an apparent increase in thrust of about 1.2 percent at high power levels. The cause of this apparent thrust increase has not as yet been determined.

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4. Lyon, T.F., Dodds, W.J., and Bahr, D.W., "Determination of the Effects of Ambient Conditions on CFM56 Aircraft Engine Emissions", EPA-460/3-79/011, December 1979.
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APPENDIX A

EMISSIONS TEST SUMMARY SHEETS FOR CF6-50C2 ENGINES WITH JP-4 FUEL

This appendix contains emissions test summary sheets from tests of twelve CF6-50C2 engines on JP-4 fuel. There are two summary sheets for each engine tested, the first giving emissions data from rake A (FAA diamond pattern), and the second listing emissions data from rake B (EPA cruciform pattern). Also included is a list of nomenclature for the test summary sheet.

Data from tests of the following engines are included:

April 10, 1979	ESN 517-497
April 12, 1979	ESN 517-503
April 18, 1979	ESN 517-502
April 20, 1979	ESN 517-504
May 15, 1979	ESN 517-523
May 18, 1979	ESN 517-524
June 5, 1979	ESN 517-533
June 6, 1979	ESN 517-534
June 11, 1979	ESN 517-535
June 12, 1979	ESN 517-537
June 14, 1979	ESN 517-539
June 15, 1979	ESN 517-538

LIST OF NOMENCLATURE FOR

EMISSIONS TEST SUMMARY SHEET

RAKE - "A" is diamond, "B" is cruciform
RDG - Test Data reading number for individual engine
FNK,LB - Corrected thrust, uninstalled
T2, F - Engine inlet (screen) temperature
HUM, GR/LB - Absolute Humidity
BARO, PSIA - Barometric (outside ambient) pressure
P2, PSIA - Engine inlet (bellmouth) total pressure
W2, PPS - Total engine (bellmouth) airflow rate
T3, F - Compressor discharge total temperature
P3, PSIA - Compressor discharge total pressure
W36, PPS - Combustor airflow rate
WFE, PPH - Actual engine fuel flow rate
FAR4 - Combustor discharge fuel-air ratio
FAR8 - Core engine (primary nozzle) fuel-air ratio
XNL, RPM - Fan speed (physical)
XNH, RPM - Core engine speed (physical)
CO, PPM - CO concentration (semi-dry)
COZ, PCT - CO_2 concentration (semi-dry)
HC, PPM - HC concentration (wet)
NO, PPM - NO concentration (wet)
NO_x, PPM - Nitrogen oxides concentration (wet)
EICO - CO emission index lb/1000 lb fuel
EIHC - HC emission index lb/1000 lb fuel
EINO - NO emission index lb/1000 lb fuel
EINOX - NO_x emission index lb/1000 lb fuel
SMOKE - Smoke number
FARGAS - Fuel-air ratio calculated from gas analysis
CEFF - Combustion efficiency calculated from gas analysis
T3RF, F - Reference T3 value for correction of emission indices to reference day conditions
P3RF, PSIA - Reference P3 value

HUMRF - Reference humidity value (44 grains/lb)
WFEK - Corrected engine fuel flow rate
EICOK - CO emission index corrected to reference day conditions
EIHCK - HC emission index corrected to reference day conditions
EINOXK - NO_x emission index corrected to reference day conditions
EPAPCO - CO EPA parameter
EPAPHC - HC EPA parameter
EPAPNOX - NO_x EPA parameter
MAX SMOKE - Maximum (of 5 power settings) smoke number

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 4/10/79 CF6-50C2 ESN 517-497 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	14.	15.	16.	17.	18.
FNK, LB	1805.	51880.	43290.	15780.	1790.
T2, F	51.1	50.7	51.5	50.6	51.8
HUM, GR/LB	19.	19.	19.	19.	19.
BARO, PSIA	14.446	14.447	14.450	14.449	14.449
P2, PSIA	14.439	14.290	14.304	14.384	14.440
W2, PPS	283.	1497.	1378.	840.	281.
T3, F	306.	997.	926.	652.	306.
P3, PSIA	41.7	437.4	364.5	169.6	41.8
W36, PPS	29.3	227.8	195.8	105.8	29.7
WFE, PPH	1284.	18384.	14493.	5024.	1256.
FAR4	0.01222	0.02248	0.02062	0.01323	0.01179
FAR8	0.01010	0.01830	0.01674	0.01099	0.00981
XNL, RPM	813.	3797.	3452.	2296.	812.
XNH, RPM	6300.	10241.	9888.	8609.	6293.
EMISSION DATA					
CO, PPM	800.8	3.8	3.2	63.2	821.6
CO2, PCT	2.000	3.980	3.660	2.330	1.880
HC, PPM	679.8	32.5	40.9	29.0	804.6
NO, PPM	4.8	376.8	272.7	56.2	4.6
NOX, PPM	16.3	397.2	295.4	70.7	15.9
EICO	74.50	0.20	0.20	5.40	80.40
EIHC	36.90	1.00	1.30	1.40	45.90
EINO	0.70	32.20	25.30	8.10	0.80
EINOX	2.54	33.95	27.36	10.13	2.59
SMOKE	1.7	1.3	3.7	2.8	3.0
FARGAS	0.01030	0.01895	0.01745	0.01121	0.00981
CEFF	95.04	99.91	99.88	99.75	94.12
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1316.	19047.	14988.	5172.	1286.
EICOK	72.87	0.18	0.18	5.27	78.73
EIHCK	35.35	0.80	1.05	1.28	43.97
EINOXK	2.42	33.92	27.29	9.67	2.46

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.852	86.9
EPAPHC	0.435	44.4
EPAPNOX	0.526	53.6

MAX SMOKE = 3.7

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 4/10/79 CF6-50C2 ESN 517-497 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	14.	15.	16.	17.	18.
FNK, LB	1805.	51880.	43290.	15780.	1790.
T2, F	51.1	50.7	51.5	50.6	51.8
HUM, GR/LB	19.	19.	19.	19.	19.
BARO, PSIA	14.446	14.447	14.450	14.449	14.449
P2, PSIA	14.439	14.290	14.304	14.384	14.440
W2, PPS	283.	1497.	1378.	840.	281.
T3, F	306.	997.	926.	652.	306.
P3, PSIA	41.7	437.4	364.5	169.6	41.8
W36, PPS	29.3	227.8	195.8	105.8	29.7
WFE, PPH	1284.	18384.	14493.	5024.	1256.
FAR4	0.01222	0.02248	0.02062	0.01323	0.01179
FAR8	0.01010	0.01830	0.01674	0.01099	0.00981
XNL, RPM	813.	3797.	3452.	2296.	812.
XNH, RPM	6300.	10241.	9888.	8609.	6293.
EMISSION DATA					
CO, PPM	791.8	2.7	3.5	59.2	804.7
CO2, PCT	1.950	3.890	3.560	2.280	1.910
HC, PPM	755.3	39.6	38.3	25.1	761.9
NO, PPM	4.6	358.7	269.3	56.7	5.0
NOX, PPM	16.1	385.9	292.0	71.0	16.2
EICO	74.90	0.10	0.20	5.20	77.60
EIHC	41.70	1.20	1.30	1.30	42.90
EINO	0.70	31.40	25.60	8.30	0.80
EINOX	2.55	33.74	27.76	10.38	2.61
SMOKE	2.1	1.9	4.7	2.5	3.8
FARGAS	0.01014	0.01852	0.01700	0.01099	0.00995
CEFF	94.62	99.89	99.88	99.77	94.45
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1316.	19047.	14988.	5172.	1286.
EICOK	73.26	0.09	0.18	5.07	75.99
EIHCK	39.95	0.95	1.05	1.19	41.10
EINOXK	2.43	33.71	27.69	9.91	2.48

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.846	86.2
EPAPHC	0.464	47.3
EPAPNOX	0.531	54.2

MAX SMOKE = 4.7

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 4/12/79 CF6-50C2 ESN 517-503 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	11.	12.	14.	15.	16.
FNK, LB	1740.	51980.	43220.	15580.	1790.
T2, F	70.8	70.3	72.8	73.0	74.0
HUM, GR/LB	62.	62.	62.	62.	62.
BARO, PSIA	14.367	14.364	14.364	14.365	14.369
P2, PSIA	14.358	14.199	14.223	14.301	14.361
W2, PPS	280.	1498.	1376.	834.	280.
T3, F	330.	1043.	975.	691.	334.
P3, PSIA	41.4	429.9	360.3	167.2	41.6
W36, PPS	28.8	219.7	190.0	102.6	29.2
WFE, PPH	1292.	18777.	14832.	5079.	1252.
FAR4	0.01257	0.02395	0.02188	0.01387	0.01201
FAR8	0.01048	0.01933	0.01777	0.01150	0.01001
XNL, RPM	827.	3853.	3516.	2342.	833.
XNH, RPM	6382.	10384.	10043.	8724.	6395.
EMISSION DATA					
CO, PPM	765.5	3.8	3.1	44.0	756.0
CO2, PCT	2.130	4.110	3.790	2.430	1.970
HC, PPM	565.7	11.0	13.9	18.1	624.6
NO, PPM	5.8	364.4	265.1	59.4	7.3
NOX, PPM	16.4	391.4	287.6	70.4	15.6
EICO	67.60	0.20	0.20	3.60	71.40
EIHC	29.50	0.30	0.50	0.90	34.80
EINO	0.90	30.50	24.00	8.30	1.20
EINOX	2.45	32.81	26.05	9.82	2.49
SMOKE	2.6	4.4	5.3	4.7	2.9
FARGAS	0.01074	0.01933	0.01786	0.01154	0.01005
CEFF	95.85	99.97	99.96	99.84	95.30
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1301.	19127.	15045.	5123.	1256.
EICOK	69.96	0.21	0.21	3.84	74.81
EIHCK	33.55	0.33	0.57	1.09	40.72
EINOXK	2.50	33.72	26.51	9.77	2.51

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.797	81.2
EPAPHC	0.397	40.5
EPAPNOX	0.519	52.9

MAX SMOKE = 5.3

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 4/12/79 CF6-50C2 ESN 517-503 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	11.	12.	14.	15.	16.
FNK, LB	1740.	51980.	43220.	15580.	1790.
T2, F	70.8	70.3	72.8	73.0	74.0
HUM, GR/LB	62.	62.	62.	62.	62.
BARO, PSIA	14.367	14.364	14.364	14.365	14.369
P2, PSIA	14.358	14.199	14.223	14.301	14.361
W2, PPS	280.	1498.	1376.	834.	280.
T3, F	330.	1043.	975.	691.	334.
P3, PSIA	41.4	429.9	360.3	167.2	41.6
W36, PPS	28.8	219.7	190.0	102.6	29.2
WFE, PPH	1292.	18777.	14832.	5079.	1252.
FAR4	0.01257	0.02395	0.02188	0.01387	0.01201
FAR8	0.01048	0.01933	0.01777	0.01150	0.01001
XNL, RPM	827.	3853.	3516.	2342.	833.
XNH, RPM	6382.	10384.	10043.	8724.	6395.
EMISSION DATA					
CO, PPM	742.4	3.8	2.5	39.7	724.9
CO2, PCT	2.070	4.040	3.720	2.390	1.960
HC, PPM	561.0	12.3	13.9	15.5	606.5
NO, PPM	7.0	357.6	260.6	57.9	7.2
NOX, PPM	16.2	383.5	284.3	69.5	15.6
EICO	67.30	0.20	0.10	3.30	69.20
EIHC	30.00	0.30	0.50	0.80	34.10
EINO	1.10	30.40	24.00	8.20	1.20
EINOX	2.48	32.63	26.20	9.82	2.52
SMOKE	2.5	3.5	4.8	3.1	3.1
FARGAS	0.01047	0.01904	0.01755	0.01138	0.00994
CEFF	95.81	99.96	99.96	99.86	95.41
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1301.	19127.	15045.	5123.	1256.
EICOK	69.64	0.21	0.10	3.52	72.51
EIHCK	34.12	0.33	0.57	0.97	39.90
EINOXK	2.53	33.53	26.66	9.77	2.54

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.784	80.0
EPAPHC	0.398	40.6
EPAPNOX	0.520	53.0

MAX SMOKE = 4.8

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 4/18/79 CF6-50C2 ESN 517-502 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	11.	12.	14.	15.	16.
FNK, LB	1800.	51010.	43640.	15610.	1820.
T2, F	62.6	61.6	64.1	62.5	61.8
HUM, GR/LB	28.	28.	28.	28.	28.
BARO, PSIA	14.568	14.565	14.565	14.563	14.562
P2, PSIA	14.557	14.404	14.408	14.496	14.554
W2, PPS	280.	1491.	1387.	838.	279.
T3, F	317.	1016.	960.	671.	315.
P3, PSIA	41.9	434.3	371.9	170.3	41.9
W36, PPS	29.0	222.4	195.5	104.5	29.3
WFE, PPH	1284.	18288.	14890.	5025.	1247.
FAR4	0.01233	0.02294	0.02124	0.01342	0.01185
FAR8	0.01016	0.01829	0.01702	0.01098	0.00980
XNL, RPM	819.	3784.	3498.	2316.	816.
XNH, RPM	6325.	10240.	9952.	8620.	6309.
EMISSION DATA					
CO, PPM	773.8	7.5	6.5	51.7	798.8
CO2, PCT	1.980	3.990	3.670	2.310	1.890
HC, PPM	635.1	21.4	24.3	43.7	824.6
NO, PPM	6.3	389.3	300.4	63.9	7.1
NOX, PPM	16.1	418.6	326.3	74.2	15.4
EICO	72.80	0.40	0.40	4.40	77.80
EIHC	34.90	0.70	0.80	2.20	46.90
EINO	1.00	33.20	27.80	9.20	1.20
EINOX	2.53	35.75	30.24	10.73	2.51
SMOKE	3.5	3.4	2.1	0.6	3.0
FARGAS	0.01017	0.01896	0.01745	0.01111	0.00983
CEFF	95.26	99.94	99.92	99.70	94.09
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1289.	18572.	15078.	5066.	1253.
EICOK	73.37	0.39	0.41	4.51	78.01
EIHCK	36.17	0.64	0.82	2.31	47.92
EINOXK	2.41	35.29	28.62	10.08	2.40

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.834	85.0
EPAPHC	0.447	45.6
EPAPNOX	0.545	55.5

MAX SMOKE = 3.5

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 4/18/79 CF6-50C2 ESN 517-502 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	11.	12.	14.	15.	16.
FNK, LB	1800.	51010.	43640.	15610.	1820.
T2, F	62.6	61.6	64.1	62.5	61.8
HUM, GR/LB	28.	28.	28.	28.	28.
BARO, PSIA	14.568	14.565	14.565	14.563	14.562
P2, PSIA	14.557	14.404	14.408	14.496	14.554
W2, PPS	280.	1491.	1387.	838.	279.
T3, F	317.	1016.	960.	671.	315.
P3, PSIA	41.9	434.3	371.9	170.3	41.9
W36, PPS	29.0	222.4	195.5	104.5	29.3
WFE, PPH	1284.	18288.	14890.	5025.	1247.
FAR4	0.01233	0.02294	0.02124	0.01342	0.01185
FAR8	0.01016	0.01829	0.01702	0.01098	0.00980
XNL, RPM	819.	3784.	3498.	2316.	816.
XNH, RPM	6325.	10240.	9952.	8620.	6309.
EMISSION DATA					
CO, PPM	753.3	6.0	6.3	50.5	778.0
CO2, PCT	1.970	3.870	3.600	2.290	1.890
HC, PPM	611.8	21.7	23.6	44.0	711.5
NO, PPM	7.0	378.1	295.9	63.5	7.2
NOX, PPM	16.1	411.8	319.5	74.1	15.8
EICO	71.40	0.30	0.30	4.40	76.10
EIHC	34.00	0.70	0.80	2.30	40.70
EINO	1.10	33.30	27.90	9.30	1.20
EINOX	2.55	36.27	30.16	10.80	2.60
SMOKE	3.1	1.9	3.1	3.5	3.8
FARGAS	0.01010	0.01838	0.01713	0.01102	0.00979
CEFF	95.38	99.93	99.92	99.70	94.68
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1289.	18572.	15078.	5066.	1253.
EICOK	71.96	0.29	0.30	4.51	76.31
EIHCK	35.24	0.64	0.82	2.42	41.58
EINOXK	2.43	35.81	28.54	10.15	2.48

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.816	83.2
EPAPHC	0.422	43.1
EPAPNOX	0.547	55.8

MAX SMOKE = 3.8

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 4/20/79 CF6-50C2 ESN 517-504 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	11.	12.	13.	14.
FNK, LB	1780.	52078.	43510.	15560.	1770.
T2, F	67.4	67.0	67.3	67.8	67.9
HUM, GR/LB	22.	22.	22.	22.	22.
BARO, PSIA	14.519	14.513	14.512	14.512	14.512
P2, PSIA	14.510	14.358	14.366	14.451	14.503
W2, PPS	280.	1501.	1382.	837.	278.
T3, F	331.	1043.	967.	685.	328.
P3, PSIA	42.2	438.0	368.2	171.9	42.0
W36, PPS	28.7	221.5	192.5	104.8	29.2
WFE, PPH	1335.	18880.	14948.	5110.	1256.
FAR4	0.01297	0.02383	0.02164	0.01359	0.01198
FAR8	0.01060	0.01904	0.01739	0.01124	0.00987
XNL, RPM	830.	3841.	3507.	2340.	825.
XNH, RPM	6423.	10339.	10007.	8720.	6376.
EMISSION DATA					
CO, PPM	776.9	4.1	2.6	42.7	763.7
CO2, PCT	2.100	4.020	3.670	2.370	1.950
HC, PPM	614.0	8.7	8.1	10.0	634.1
NO, PPM	7.3	439.5	321.8	65.5	6.1
NOX, PPM	17.3	488.8	350.9	78.5	16.4
EICO	69.30	0.20	0.10	3.60	72.80
EIHC	32.00	0.20	0.20	0.50	35.30
EINO	1.10	37.20	29.80	9.30	1.00
EINOX	2.59	41.40	32.52	11.11	2.62
SMOKE	3.2	3.7	2.2	3.5	1.8
FARGAS	0.01074	0.01912	0.01745	0.01136	0.01005
CEFF	95.59	99.97	99.97	99.87	95.22
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1338.	19136.	15138.	5142.	1259.
EICOK	72.59	0.21	0.10	3.84	75.50
EIHCK	36.65	0.22	0.22	0.58	39.57
EINOXK	2.35	37.94	29.97	9.95	2.40

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.835	85.2
EPAPHC	0.419	42.7
EPAPNOX	0.577	58.8

MAX SMOKE = 3.7

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 4/20/79 CF6-50C2 ESN 517-504 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	11.	12.	13.	14.
FNK, LB	1780.	52078.	43510.	15560.	1770.
T2, F	67.4	67.0	67.3	67.8	67.9
HUM, GR/LB	22.	22.	22.	22.	22.
BARO, PSIA	14.519	14.513	14.512	14.512	14.512
P2, PSIA	14.510	14.358	14.366	14.451	14.503
W2, PPS	280.	1501.	1382.	837.	278.
T3, F	331.	1043.	967.	685.	328.
P3, PSIA	42.2	438.0	368.2	171.9	42.0
W36, PPS	28.7	221.5	192.5	104.8	29.2
WFE, PPH	1335.	18880.	14948.	5110.	1256.
FAR4	0.01297	0.02383	0.02164	0.01359	0.01198
FAR8	0.01060	0.01904	0.01739	0.01124	0.00987
XNL, RPM	830.	3841.	3507.	2340.	825.
XNH, RPM	6423.	10339.	10007.	8720.	6376.
EMISSION DATA					
CO, PPM	755.8	3.6	2.6	38.3	751.9
CO2, PCT	2.040	3.970	3.640	2.350	1.960
HC, PPM	587.3	8.7	7.8	9.4	614.0
NO, PPM	7.6	436.1	316.2	65.5	6.3
NOX, PPM	17.5	472.0	346.4	78.2	16.5
EICO	69.30	0.20	0.10	3.30	71.60
EIHC	31.50	0.20	0.20	0.50	34.20
EINO	1.20	37.40	29.50	9.30	1.00
EINOX	2.69	40.50	32.36	11.16	2.63
SMOKE	3.4	3.6	3.1	1.7	4.3
FARGAS	0.01045	0.01887	0.01731	0.01127	0.01006
CEFF	95.64	99.97	99.97	99.88	95.35
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1338.	19136.	15138.	5142.	1259.
EICOK	72.59	0.21	0.10	3.52	74.26
EIHCK	36.08	0.22	0.22	0.58	38.34
EINOXK	2.44	37.12	29.82	9.99	2.41

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.830	84.6
EPAPHC	0.411	41.9
EPAPNOX	0.572	58.4

MAX SMOKE = 4.3

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 5/15/79 CF6-50C2 ESN 517-523 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	14.	15.	16.	17.	18.
FNK, LB	1777.	52889.	43841.	15377.	1818.
T2, F	68.9	68.0	67.6	67.6	67.2
HUM, GR/LB	36.	44.	44.	44.	42.
BARO, PSIA	14.509	14.509	14.511	14.512	14.514
P2, PSIA	14.498	14.347	14.369	14.460	14.505
W2, PPS	280.	1504.	1381.	831.	282.
T3, F	329.	1050.	972.	682.	326.
P3, PSIA	42.2	441.0	369.3	169.5	42.5
W36, PPS	29.0	222.0	192.5	103.3	29.6
WFE, PPH	1300.	19285.	15131.	5090.	1259.
FAR4	0.01251	0.02428	0.02197	0.01378	0.01188
FAR8	0.01036	0.01952	0.01763	0.01131	0.00981
XNL, RPM	827.	3852.	3512.	2329.	830.
XNH, RPM	6388.	10387.	10007.	8685.	6376.
EMISSION DATA					
CO, PPM	726.6	3.4	1.8	41.7	744.1
CO2, PCT	2.000	4.080	3.720	2.380	1.870
HC, PPM	520.7	7.1	8.4	9.4	595.6
NO, PPM	5.4	411.4	303.7	62.3	4.9
NOX, PPM	16.3	443.2	328.7	75.2	15.1
EICO	68.20	0.20	0.10	3.50	74.10
EIHC	28.70	0.20	0.20	0.50	34.80
EINO	0.90	34.50	27.90	8.80	0.80
EINOX	2.58	37.18	30.19	10.61	2.52
SMOKE	0.8	4.0	3.4	3.5	2.3
FARGAS	0.01017	0.01931	0.01761	0.01139	0.00959
CEFF	95.91	99.98	99.97	99.88	95.24
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1301.	19512.	15292.	5112.	1261.
EICOK	71.08	0.21	0.10	3.68	76.92
EIHCK	32.41	0.23	0.22	0.57	38.46
EINOXK	2.44	35.55	29.18	10.19	2.43

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.810	82.6
EPAPHC	0.374	38.2
EPAPNOX	0.566	57.7

MAX SMOKE = 4.0

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 5/15/79 CF6-50C2 ESN 517-523 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	14.	15.	16.	17.	18.
FNK, LB	1777.	52889.	43841.	15377.	1818.
T2, F	68.9	68.0	67.6	67.6	67.2
HUM, GR/LB	36.	44.	44.	44.	42.
BARO, PSIA	14.509	14.509	14.511	14.512	14.514
P2, PSIA	14.498	14.347	14.369	14.460	14.505
W2, PPS	280.	1504.	1381.	831.	282.
T3, F	329.	1050.	972.	682.	326.
P3, PSIA	42.2	441.0	369.3	169.5	42.5
W36, PPS	29.0	222.0	192.5	103.3	29.6
WFE, PPH	1300.	19285.	15131.	5090.	1259.
FAR4	0.01251	0.02428	0.02197	0.01378	0.01188
FAR8	0.01036	0.01952	0.01763	0.01131	0.00981
XNL, RPM	827.	3852.	3512.	2329.	830.
XNH, RPM	6388.	10387.	10007.	8685.	6376.
EMISSION DATA					
CO, PPM	708.0	3.4	1.8	39.9	726.6
CO2, PCT	1.970	4.020	3.680	2.370	1.890
HC, PPM	520.7	7.8	8.7	8.4	620.8
NO, PPM	8.0	413.7	299.2	62.7	6.2
NOX, PPM	16.2	442.0	325.3	75.5	15.2
EICO	67.60	0.20	0.10	3.40	71.70
EIHC	29.20	0.20	0.20	0.50	35.90
EINO	1.30	35.30	27.70	8.90	1.00
EINOX	2.60	37.69	30.16	10.70	2.52
SMOKE	2.8	3.3	2.6	3.8	3.1
FARGAS	0.00999	0.01899	0.01744	0.01133	0.00968
CEFF	95.88	99.98	99.97	99.89	95.20
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1301.	19512.	15292.	5112.	1261.
EICOK	70.45	0.21	0.10	3.57	74.43
EIHCK	32.97	0.23	0.22	0.57	39.68
EINOXK	2.46	36.04	29.15	10.28	2.43

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.797	81.3
EPAPHC	0.382	39.0
EPAPNOX	0.568	57.9

MAX SMOKE = 3.8

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 5/18/79 CF6-50C2 ESN 517-524 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	11.	12.	13.	14.	15.
FNK, LB	1757.	52327.	43740.	15330.	1781.
T2, F	65.6	65.7	67.7	68.4	69.9
HUM, GR/LB	45.	39.	39.	37.	37.
BARO, PSIA	14.529	14.525	14.521	14.521	14.519
P2, PSIA	14.521	14.373	14.381	14.460	14.510
W2, PPS	284.	1496.	1379.	829.	285.
T3, F	325.	1039.	970.	682.	330.
P3, PSIA	42.9	435.2	365.5	168.4	43.2
W36, PPS	29.7	219.7	190.2	102.4	30.3
WFE, PPH	1307.	18996.	15076.	5096.	1253.
FAR4	0.01229	0.02415	0.02214	0.01390	0.01154
FAR8	0.01020	0.01941	0.01773	0.01148	0.00958
XNL, RPM	834.	3820.	3500.	2324.	840.
XNH, RPM	6359.	10243.	9931.	8658.	6364.
EMISSION DATA					
CO, PPM	664.6	1.8	1.6	39.8	689.4
CO2, PCT	1.840	4.140	3.720	2.420	1.870
HC, PPM	505.5	5.2	4.5	4.9	542.5
NO, PPM	5.1	401.1	260.7	68.8	4.1
NOX, PPM	14.6	437.1	287.6	81.5	14.6
EICO	67.60	0.10	0.10	3.30	68.90
EIHC	30.10	0.10	0.10	0.20	31.80
EINO	0.90	33.20	23.90	9.60	0.70
EINOX	2.49	36.16	26.41	11.33	2.45
SMOKE	2.5	1.1	3.3	3.4	0.9
FARGAS	0.00939	0.01959	0.01762	0.01157	0.00956
CEFF	95.80	99.98	99.99	99.90	95.63
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1310.	19237.	15227.	5116.	1252.
EICOK	70.33	0.10	0.10	3.46	72.83
EIHCK	33.03	0.11	0.11	0.23	36.16
EINOXK	2.42	35.06	25.39	10.71	2.30

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.793	80.9
EPAPHC	0.370	37.7
EPAPNOX	0.522	53.2

MAX SMOKE = 3.4

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 5/18/79 CF6-50C2 ESN 517-524 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	11.	12.	13.	14.	15.
FNK, LB	1757.	52327.	43740.	15330.	1781.
T2, F	65.6	65.7	67.7	68.4	69.9
HUM, GR/LB	45.	39.	39.	37.	37.
BARO, PSIA	14.529	14.525	14.521	14.521	14.519
P2, PSIA	14.521	14.373	14.381	14.460	14.510
W2, PPS	284.	1496.	1379.	829.	285.
T3, F	325.	1039.	970.	682.	330.
P3, PSIA	42.9	435.2	365.5	168.4	43.2
W36, PPS	29.7	219.7	190.2	102.4	30.3
WFE, PPH	1307.	18996.	15076.	5096.	1253.
FAR4	0.01229	0.02415	0.02214	0.01390	0.01154
FAR8	0.01020	0.01941	0.01773	0.01148	0.00958
XNL, RPM	834.	3820.	3500.	2324.	840.
XNH, RPM	6359.	10243.	9931.	8658.	6364.
EMISSION DATA					
CO, PPM	663.3	1.6	1.8	36.9	684.4
CO2, PCT	1.800	4.050	3.720	2.400	1.860
HC, PPM	504.1	4.9	4.2	4.9	527.0
NO, PPM	5.6	391.0	255.1	68.8	4.6
NOX, PPM	14.2	422.5	275.3	82.0	14.9
EICO	69.00	0.10	0.10	3.10	68.90
EIHC	30.60	0.10	0.10	0.20	31.10
EINO	1.00	33.00	23.40	9.60	0.80
EINOX	2.48	35.67	25.22	11.48	2.52
SMOKE	2.5	1.4	1.6	2.5	1.4
FARGAS	0.00919	0.01919	0.01765	0.01147	0.00949
CEFF	95.72	99.99	99.99	99.91	95.69
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1310.	19237.	15227.	5116.	1252.
EICOK	71.78	0.10	0.10	3.25	72.83
EIHCK	33.58	0.11	0.11	0.23	35.37
EINOXK	2.41	34.58	24.24	10.85	2.37

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.803	81.9
EPAPHC	0.372	37.9
EPAPNOX	0.509	51.9

MAX SMOKE = 2.5

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/5/79 CF6-50C2 ESN 517-533 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	11.	12.	13.	14.
FNK, LB	1782.	52126.	44011.	15808.	1811.
T2, F	84.6	83.8	83.0	84.6	83.7
HUM, GR/LB	62.	62.	62.	62.	62.
BARO, PSIA	14.315	14.313	14.315	14.315	14.316
P2, PSIA	14.304	14.165	14.178	14.251	14.308
W2, PPS	266.	1499.	1388.	840.	277.
T3, F	341.	1080.	1001.	711.	342.
P3, PSIA	40.4	428.2	366.0	168.1	40.8
W36, PPS	27.4	213.0	188.9	101.0	28.1
WFE, PPH	1297.	19157.	15228.	5180.	1242.
FAR4	0.01328	0.02520	0.02259	0.01438	0.01238
FAR8	0.01099	0.02037	0.01846	0.01199	0.01033
XNL, RPM	824.	3893.	3568.	2371.	826.
XNH, RPM	6452.	10483.	10187.	8879.	6456.
EMISSION DATA					
CO, PPM	741.7	3.2	2.7	23.1	729.3
CO2, PCT	2.130	4.380	3.930	2.490	2.010
HC, PPM	509.3	5.8	7.4	5.2	458.4
NO, PPM	10.5	439.2	328.3	75.2	8.7
NOX, PPM	18.1	476.6	356.6	87.2	17.1
EICO	65.50	0.10	0.10	1.80	68.50
EIHC	26.50	0.10	0.20	0.20	25.40
EINO	1.60	34.60	28.70	10.20	1.40
EINOX	2.71	37.53	31.16	11.86	2.72
SMOKE	2.1	2.9	1.1	2.5	3.7
FARGAS	0.01074	0.02060	0.01853	0.01183	0.01010
CEFF	96.16	99.98	99.98	99.94	96.19
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1293.	19297.	15337.	5182.	1239.
EICOK	68.83	0.11	0.11	2.03	72.51
EIHCK	32.60	0.14	0.28	0.28	31.47
EINOXK	2.73	35.81	29.90	11.30	2.72

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.762	77.7
EPAPHC	0.351	35.8
EPAPNOX	0.585	59.6

MAX SMOKE = 3.7

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/5/79 CF6-50C2 ESN 517-533 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	11.	12.	13.	14.
FNK, LB	1782.	52126.	44011.	15808.	1811.
T2, F	84.6	83.8	83.0	84.6	83.7
HUM, GR/LB	62.	62.	62.	62.	62.
BARO, PSIA	14.315	14.313	14.315	14.315	14.316
P2, PSIA	14.304	14.165	14.178	14.251	14.308
W2, PPS	266.	1499.	1388.	840.	277.
T3, F	341.	1080.	1001.	711.	342.
P3, PSIA	40.4	428.2	366.0	168.1	40.8
W36, PPS	27.4	213.0	188.9	101.0	28.1
WFE, PPH	1297.	19157.	15228.	5180.	1242.
FAR4	0.01328	0.02520	0.02259	0.01438	0.01238
FAR8	0.01099	0.02037	0.01846	0.01199	0.01033
XNL, RPM	824.	3893.	3568.	2371.	826.
XNH, RPM	6452.	10483.	10187.	8879.	6456.
EMISSION DATA					
CO, PPM	712.0	3.5	2.4	21.7	709.5
CO2, PCT	2.130	4.260	3.890	2.400	2.030
HC, PPM	475.4	6.5	6.8	5.8	427.8
NO, PPM	11.4	434.7	324.9	73.3	10.2
NOX, PPM	18.7	473.2	353.2	83.9	17.4
EICO	63.10	0.20	0.10	1.80	66.10
EIHC	24.80	0.20	0.20	0.30	23.40
EINO	1.70	35.20	28.70	10.30	1.60
EINOX	2.80	38.27	31.21	11.82	2.75
SMOKE	2.6	1.6	1.8	3.0	1.6
FARGAS	0.01071	0.02005	0.01831	0.01141	0.01019
CEFF	96.36	99.98	99.98	99.93	96.41
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1293.	19297.	15337.	5182.	1239.
EICOK	66.30	0.22	0.11	2.03	69.97
EIHCK	30.51	0.29	0.28	0.42	28.99
EINOXK	2.82	36.52	29.94	11.27	2.75

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.735	75.0
EPAPHC	0.329	33.6
EPAPNOX	0.589	60.1

MAX SMOKE = 3.0

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/6/79 CF6-50C2 ESN 517-534 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	11.	12.	13.	14.	15.
FNK, LB	1726.	51839.	44022.	15779.	1778.
T2, F	88.8	87.7	86.6	86.8	87.8
HUM, GR/LB	99.	99.	88.	88.	88.
BARO, PSIA	14.327	14.327	14.328	14.328	14.328
P2, PSIA	14.318	14.173	14.188	14.276	14.319
W2, PPS	267.	1497.	1390.	841.	276.
T3, F	352.	1089.	1020.	721.	348.
P3, PSIA	39.6	428.0	366.1	168.3	40.7
W36, PPS	26.5	212.8	187.7	100.6	27.9
WFE, PPH	1307.	19182.	15444.	5235.	1248.
FAR4	0.01388	0.02540	0.02314	0.01463	0.01257
FAR8	0.01115	0.02043	0.01867	0.01213	0.01041
XNL, RPM	826.	3897.	3583.	2375.	826.
XNH, RPM	6455.	10542.	10237.	8903.	6422.
EMISSION DATA					
CO, PPM	633.1	2.6	2.1	21.3	691.1
CO2, PCT	2.090	4.460	4.080	2.590	2.060
HC, PPM	363.5	3.9	1.9	2.6	447.2
ND, PPM	6.5	413.9	289.9	71.7	6.3
NOX, PPM	13.6	450.0	333.9	83.1	14.5
EICO	57.80	0.10	0.10	1.60	63.40
EIHC	19.70	0.10	0.10	0.10	24.40
EINO	1.00	32.30	24.60	9.40	1.00
EINOX	2.12	35.09	28.35	10.94	2.27
SMOKE	3.7	1.0	2.5	3.9	3.6
FARGAS	0.01033	0.02081	0.01908	0.01222	0.01029
CEFF	96.94	99.99	99.99	99.95	96.40
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1293.	19188.	15461.	5207.	1237.
EICOK	61.81	0.11	0.12	1.85	68.05
EIHCK	26.22	0.15	0.16	0.15	31.55
EINOXK	2.32	36.32	28.06	10.95	2.41

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.692	70.6
EPAPHC	0.299	30.4
EPAPNOX	0.563	57.4

MAX SMOKE = 3.9

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/6/79 CF6-50C2 ESN 517-534 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	11.	12.	13.	14.	15.
FNK, LB	1726.	51839.	44022.	15779.	1778.
T2, F	88.8	87.7	86.6	86.8	87.8
HUM, GR/LB	99.	99.	88.	88.	88.
BARO, PSIA	14.327	14.327	14.328	14.328	14.328
P2, PSIA	14.318	14.173	14.188	14.276	14.319
W2, PPS	267.	1497.	1390.	841.	276.
T3, F	352.	1089.	1020.	721.	348.
P3, PSIA	39.6	428.0	366.1	168.3	40.7
W36, PPS	26.5	212.8	187.7	100.6	27.9
WFE, PPH	1307.	19182.	15444.	5235.	1248.
FAR4	0.01388	0.02540	0.02314	0.01463	0.01257
FAR8	0.01115	0.02043	0.01867	0.01213	0.01041
XNL, RPM	826.	3897.	3583.	2375.	826.
XNH, RPM	6455.	10542.	10237.	8903.	6422.
EMISSION DATA					
CO, PPM	629.4	2.9	2.3	21.0	667.4
CO2, PCT	2.060	4.370	4.040	2.570	2.060
HC, PPM	372.4	3.6	1.6	2.6	427.3
NO, PPM	6.7	411.7	302.3	71.0	7.0
NOX, PPM	14.3	445.5	336.1	83.5	14.7
EICO	58.30	0.10	0.10	1.60	61.30
EIHC	20.50	0.10	0.	0.10	23.30
EINO	1.10	32.70	25.90	9.40	1.10
EINOX	2.25	35.36	28.80	11.08	2.31
SMOKE	3.8	1.3	3.4	2.7	1.5
FARGAS	0.01019	0.02043	0.01890	0.01212	0.01027
CEFF	96.86	99.99	99.99	99.95	96.54
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1293.	19188.	15461.	5207.	1237.
EICOK	62.34	0.11	0.12	1.85	65.79
EIHCK	27.28	0.15	0.	0.15	30.13
EINOXK	2.46	36.60	28.50	11.09	2.45

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.690	70.4
EPAPHC	0.301	30.7
EPAPNOX	0.571	58.2

MAX SMOKE = 3.8

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/11/79 CF6-50C2 ESN 517-535 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	11.	12.	13.	14.
FNK, LB	1766.	52231.	43725.	15774.	1770.
T2, F	62.8	63.7	65.2	64.5	64.6
HUM, GR/LB	55.	55.	56.	57.	57.
BARO, PSIA	14.484	14.483	14.482	14.482	14.482
P2, PSIA	14.473	14.331	14.341	14.428	14.472
W2, PPS	275.	1501.	1386.	841.	257.
T3, F	322.	1038.	964.	681.	322.
P3, PSIA	42.0	439.8	371.8	171.4	41.9
W36, PPS	29.0	223.6	195.6	104.8	33.3
WFE, PPH	1306.	18991.	15032.	5152.	1236.
FAR4	0.01261	0.02377	0.02152	0.01377	0.01174
FAR8	0.01019	0.01923	0.01758	0.01150	0.00956
XNL, RPM	840.	3833.	3501.	2329.	837.
XNH, RPM	6388.	10373.	10027.	8716.	6340.
EMISSION DATA					
CO, PPM	727.0	0.5	0.8	30.1	725.8
CO2, PCT	1.910	4.220	3.870	2.400	1.830
HC, PPM	529.2	2.9	2.3	2.6	561.0
NO, PPM	2.1	373.1	280.4	60.7	1.9
NOX, PPM	12.1	414.9	307.5	73.3	11.5
EICO	71.30	0.	0.	2.50	73.90
EIHC	30.50	0.10	0.10	0.10	33.50
EINO	0.40	30.40	24.90	8.60	0.30
EINOX	2.01	33.83	27.26	10.34	1.97
SMOKE	4.4	2.5	2.5	2.4	2.8
FARGAS	0.00970	0.01988	0.01825	0.01140	0.00935
CEFF	95.68	99.99	99.99	99.93	95.35
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1316.	19306.	15246.	5197.	1243.
EICOK	72.85	0.	0.	2.64	75.41
EIHCK	32.76	0.11	0.11	0.11	35.98
EINOXK	2.03	34.18	27.59	10.26	2.01

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.815	83.1
EPAPHC	0.367	37.4
EPAPNOX	0.537	54.8

MAX SMOKE = 4.4

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/11/79 CF6-50C2 ESN 517-535 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	11.	12.	13.	14.
FNK, LB	1766.	52231.	43725.	15774.	1770.
T2, F	62.8	63.7	65.2	64.5	64.6
HUM, GR/LB	55.	55.	56.	57.	57.
BARO, PSIA	14.484	14.483	14.482	14.482	14.482
P2, PSIA	14.473	14.331	14.341	14.428	14.472
W2, PPS	275.	1501.	1386.	841.	257.
T3, F	322.	1038.	964.	681.	322.
P3, PSIA	42.0	439.8	371.8	171.4	41.9
W36, PPS	29.0	223.6	195.6	104.8	33.3
WFE, PPH	1306.	18991.	15032.	5152.	1236.
FAR4	0.01261	0.02377	0.02152	0.01377	0.01174
FAR8	0.01019	0.01923	0.01758	0.01150	0.00956
XNL, RPM	840.	3833.	3501.	2329.	837.
XNH, RPM	6388.	10373.	10027.	8716.	6340.
EMISSION DATA					
CO, PPM	704.0	0.5	0.	30.3	713.7
CO2, PCT	1.920	4.120	3.770	2.350	1.840
HC, PPM	502.7	2.6	2.3	2.9	553.6
NO, PPM	2.6	370.8	275.9	59.3	2.1
NOX, PPM	12.5	405.9	304.1	72.6	11.9
EICO	68.80	0.	0.	2.60	72.50
EIHC	28.90	0.10	0.10	0.10	33.10
EINO	0.40	31.00	25.10	8.50	0.40
EINOX	2.06	33.89	27.65	10.42	2.04
SMOKE	4.4	2.6	2.5	2.1	3.7
FARGAS	0.00973	0.01941	0.01779	0.01119	0.00937
CEFF	95.88	99.99	99.99	99.93	95.43
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1316.	19306.	15246.	5197.	1243.
EICOK	70.29	0.	0.	2.74	73.98
EIHCK	31.04	0.11	0.11	0.11	35.55
EINOXK	2.08	34.24	27.99	10.34	2.08

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.791	80.7
EPAPHC	0.352	35.9
EPAPNOX	0.543	55.3

MAX SMOKE = 4.4

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/12/79 CF6-50C2 ESN 517-537 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	11.	12.	13.	14.
FNK, LB	1709.	52189.	44013.	15798.	1792.
T2, F	76.0	76.1	76.1	75.3	75.6
HUM, GR/LB	39.	38.	39.	40.	40.
BARO, PSIA	14.481	14.479	14.478	14.478	14.478
P2, PSIA	14.471	14.320	14.327	14.422	14.470
W2, PPS	267.	1507.	1395.	847.	257.
T3, F	335.	1066.	991.	702.	335.
P3, PSIA	40.9	435.3	369.9	170.1	41.5
W36, PPS	27.8	217.9	191.4	102.5	28.7
WFE, PPH	1308.	19176.	15320.	5216.	1256.
FAR4	0.01314	0.02458	0.02236	0.01422	0.01223
FAR8	0.01085	0.01962	0.01801	0.01167	0.01013
XNL, RPM	815.	3872.	3545.	2355.	821.
XNH, RPM	6408.	10486.	10139.	8814.	6403.
EMISSION DATA					
CO, PPM	695.3	0.3	0.8	25.2	668.2
CO2, PCT	2.010	4.150	3.770	2.430	1.960
HC, PPM	396.7	2.9	3.6	2.6	434.9
NO, PPM	6.5	457.5	334.4	73.1	6.4
NOX, PPM	18.1	489.2	359.2	85.0	17.2
EICO	65.40	0.	0.	2.10	64.30
EIHC	21.80	0.10	0.10	0.10	24.50
EINO	1.00	37.80	30.30	10.10	1.00
EINOX	2.86	40.39	32.51	11.75	2.77
SMOKE	3.4	1.5	0.7	3.6	2.9
FARGAS	0.01014	0.01963	0.01788	0.01163	0.00992
CEFF	96.57	99.99	99.99	99.94	96.36
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1302.	19287.	15400.	5213.	1251.
EICOK	68.11	0.	0.	2.32	67.46
EIHCK	25.69	0.13	0.13	0.13	28.87
EINOXK	2.73	36.96	29.81	10.71	2.63

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.748	76.3
EPAPHC	0.289	29.4
EPAPNOX	0.586	59.8

MAX SMOKE = 3.6

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/12/79 CF6-50C2 ESN 517-537 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	11.	12.	13.	14.
FNK, LB	1709.	52189.	44013.	15798.	1792.
T2, F	76.0	76.1	76.1	75.3	75.6
HUM, GR/LB	39.	38.	39.	40.	40.
BARO, PSIA	14.481	14.479	14.478	14.478	14.478
P2, PSIA	14.471	14.320	14.327	14.422	14.470
W2, PPS	267.	1507.	1395.	847.	257.
T3, F	335.	1066.	991.	702.	335.
P3, PSIA	40.9	435.3	369.9	170.1	41.5
W36, PPS	27.8	217.9	191.4	102.5	28.7
WFE, PPH	1308.	19176.	15320.	5216.	1256.
FAR4	0.01314	0.02458	0.02236	0.01422	0.01223
FAR8	0.01085	0.01962	0.01801	0.01167	0.01013
XNL, RPM	815.	3872.	3545.	2355.	821.
XNH, RPM	6408.	10486.	10139.	8814.	6403.
EMISSION DATA					
CO, PPM	688.2	0.6	0.6	22.4	662.4
CO2, PCT	2.010	4.090	3.710	2.400	1.960
HC, PPM	419.9	2.9	3.9	2.6	415.2
NO, PPM	7.7	440.6	322.0	72.7	7.0
NOX, PPM	17.8	476.7	350.2	84.1	17.2
EICO	64.70	0.	0.	1.90	63.80
EIHC	23.10	0.10	0.10	0.10	23.40
EINO	1.20	36.90	29.60	10.20	1.10
EINOX	2.82	39.94	32.18	11.81	2.78
SMOKE	4.0	2.3	3.6	1.4	3.1
FARGAS	0.01015	0.01934	0.01760	0.01144	0.00991
CEFF	96.47	99.99	99.99	99.95	96.47
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1302.	19287.	15400.	5213.	1251.
EICOK	67.39	0.	0.	2.10	66.93
EIHCK	27.22	0.13	0.13	0.13	27.58
EINOXK	2.69	36.54	29.51	10.76	2.64

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.739	75.4
EPAPHC	0.297	30.3
EPAPNOX	0.581	59.3

MAX SMOKE = 4.0

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/14/79 CF6-50C2 ESN 517-539 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	11.	12.	13.	14.
FNK, LB	1694.	52633.	43796.	15534.	1735.
T2, F	85.0	84.5	84.1	83.9	85.2
HUM, GR/LB	75.	75.	75.	77.	77.
BARO, PSIA	14.512	14.512	14.512	14.511	14.509
P2, PSIA	14.504	14.355	14.367	14.450	14.501
W2, PPS	272.	1510.	1389.	836.	274.
T3, F	351.	1093.	1009.	719.	350.
P3, PSIA	40.6	441.8	369.3	170.3	41.0
W36, PPS	27.2	220.3	190.4	102.3	27.9
WFE, PPH	1327.	19471.	15321.	5207.	1286.
FAR4	0.01370	0.02480	0.02258	0.01433	0.01294
FAR8	0.01130	0.02000	0.01829	0.01187	0.01066
XNL, RPM	815.	3915.	3568.	2374.	826.
XNH, RPM	6515.	10591.	10238.	8921.	6509.
EMISSION DATA					
CO, PPM	713.0	6.0	5.3	31.0	739.5
CO2, PCT	2.070	4.300	3.880	2.510	2.000
HC, PPM	453.3	4.9	3.9	2.9	549.4
* NO, PPM	~~9.4~~	~~289.5~~	~~200.9~~	~~40.0~~	~~3.9~~
* NOX, PPM	~~9.6~~	~~321.1~~	~~218.9~~	~~47.1~~	~~8.8~~
EICO	65.20	0.30	0.30	2.50	69.40
EIHC	24.50	0.10	0.10	0.10	30.40
* EINO	~~0.50~~	~~23.30~~	~~17.90~~	5.40	0.60
* EINOX	~~1.49~~	~~25.84~~	~~19.45~~	~~6.38~~	~~1.40~~
SMOKE	1.9	4.3	2.5	4.4	2.7
FARGAS	0.01035	0.02015	0.01821	0.01186	0.01009
CEFF	96.34	99.98	99.98	99.93	95.73
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1303.	19323.	15198.	5136.	1262.
EICOK	70.42	0.35	0.34	2.89	75.13
EIHCK	32.37	0.16	0.15	0.15	39.88
* EINOXK	~~1.52~~	~~24.50~~	~~18.95~~	6.20	~~1.43~~

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.799	81.4
EPAPHC	0.374	38.2
EPAPNOX	0.368	37.5

MAX SMOKE = 4.4

* NOTE: All NO and NO_x data on this page is in error (too low) and is excluded from averages quoted in this report.

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/14/79 CF6-50C2 ESN 517-539 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	11.	12.	13.	14.
FNK, LB	1694.	52633.	43796.	15534.	1735.
T2, F	85.0	84.5	84.1	83.9	85.2
HUM, GR/LB	75.	75.	75.	77.	77.
BARO, PSIA	14.512	14.512	14.512	14.511	14.509
P2, PSIA	14.504	14.355	14.367	14.450	14.501
W2, PPS	272.	1510.	1389.	836.	274.
T3, F	351.	1093.	1009.	719.	350.
P3, PSIA	40.6	441.8	369.3	170.3	41.0
W36, PPS	27.2	220.3	190.4	102.3	27.9
WFE, PPH	1327.	19471.	15321.	5207.	1286.
FAR4	0.01370	0.02480	0.02258	0.01433	0.01294
FAR8	0.01130	0.02000	0.01829	0.01187	0.01066
XNL, RPM	815.	3915.	3568.	2374.	826.
XNH, RPM	6515.	10591.	10238.	8921.	6509.
EMISSION DATA					
CO, PPM	697.8	6.2	5.3	29.5	715.7
CO2, PCT	2.080	4.250	3.860	2.460	2.020
HC, PPM	445.0	4.9	3.9	2.9	494.5
*NO, PPM	~~4.5~~	~~287.2~~	~~201.5~~	~~38.9~~	4.6
*NOX, PPM	~~9.8~~	~~311.0~~	~~219.5~~	~~46.5~~	~~8.9~~
EICO	63.30	0.30	0.30	2.40	66.60
EIHC	23.90	0.10	0.10	0.10	27.20
*EINO	~~0.70~~	~~23.30~~	18.00	~~5.40~~	~~0.7(~~
*EINOX	~~1.52~~	~~25.27~~	19.61	~~6.41~~	~~1.41~~
SMOKE	3.2	0.7	0.9	1.9	4.3
FARGAS	0.01043	0.01995	0.01811	0.01165	0.01017
CEFF	96.44	99.98	99.98	99.93	96.07
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1303.	19323.	15198.	5136.	1262.
EICOK	68.37	0.35	0.34	2.77	72.10
EIHCK	31.58	0.16	0.15	0.15	35.68
* EINOXK	~~1.55~~	~~24.04~~	19.10	6.23	~~1.44~~

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.773	78.8
EPAPHC	0.356	36.3
EPAPNOX	0.368	37.5

MAX SMOKE = 4.3

* NOTE: All NO and NO_x data on this page is in error (too low) and is excluded from averages quoted in this report.

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/15/79 CF6-50C2 ESN 517-538 JP-4
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	11.	12.	13.	14.	15.
FNK, LB	1760.	52523.	43911.	15719.	1790.
T2, F	82.7	81.4	81.3	81.3	80.5
HUM, GR/LB	78.	78.	81.	82.	82.
BARO, PSIA	14.474	14.474	14.473	14.472	14.471
P2, PSIA	14.467	14.317	14.327	14.409	14.463
W2, PPS	280.	1507.	1392.	844.	280.
T3, F	349.	1081.	1002.	710.	343.
P3, PSIA	41.5	441.3	371.3	170.1	41.7
W36, PPS	27.9	220.5	192.0	102.4	28.7
WFE, PPH	1340.	19482.	15378.	5199.	1270.
FAR4	0.01347	0.02481	0.02251	0.01426	0.01242
FAR8	0.01097	0.02006	0.01828	0.01185	0.01018
XNL, RPM	830.	3908.	3565.	2360.	830.
XNH, RPM	6496.	10574.	10209.	8848.	6445.
EMISSION DATA					
CO, PPM	718.4	4.7	4.2	31.1	756.6
CO2, PCT	2.070	4.390	4.030	2.460	2.000
HC, PPM	521.9	6.5	4.8	4.8	569.3
NO, PPM	4.8	455.0	326.3	64.0	7.5
NOX, PPM	15.5	490.0	353.4	73.8	14.2
EICO	65.20	0.20	0.20	2.50	70.80
EIHC	28.00	0.20	0.10	0.20	31.60
EINO	0.70	35.90	28.00	8.80	1.20
EINOX	2.40	38.69	30.30	10.17	2.25
SMOKE	4.3	2.6	3.2	2.6	3.5
FARGAS	0.01042	0.02054	0.01889	0.01166	0.01011
CEFF	96.03	99.98	99.98	99.92	95.60
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1322.	19441.	15333.	5154.	1255.
EICOK	70.84	0.23	0.23	2.82	75.96
EIHCK	36.47	0.29	0.14	0.28	39.43
EINOXK	2.46	38.04	30.37	10.21	2.35

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.809	82.5
EPAPHC	0.411	41.9
EPAPNOX	0.590	60.2

MAX SMOKE = 4.3

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 6/15/79 CF6-50C2 ESN 517-538 JP-4
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	11.	12.	13.	14.	15.
FNK, LB	1760.	52523.	43911.	15719.	1790.
T2, F	82.7	81.4	81.3	81.3	80.5
HUM, GR/LB	78.	78.	81.	82.	82.
BARO, PSIA	14.474	14.474	14.473	14.472	14.471
P2, PSIA	14.467	14.317	14.327	14.409	14.463
W2, PPS	280.	1507.	1392.	844.	280.
T3, F	349.	1081.	1002.	710.	343.
P3, PSIA	41.5	441.3	371.3	170.1	41.7
W36, PPS	27.9	220.5	192.0	102.4	28.7
WFE, PPH	1340.	19482.	15378.	5199.	1270.
FAR4	0.01347	0.02481	0.02251	0.01426	0.01242
FAR8	0.01097	0.02006	0.01828	0.01185	0.01018
XNL, RPM	830.	3908.	3565.	2360.	830.
XNH, RPM	6496.	10574.	10209.	8848.	6445.
EMISSION DATA					
CO, PPM	690.3	4.9	4.4	29.8	721.1
CO2, PCT	2.050	4.310	3.960	2.440	2.030
HC, PPM	488.0	6.1	4.8	4.5	531.3
NO, PPM	5.5	444.8	319.5	63.5	8.2
NOX, PPM	15.7	481.0	346.6	73.2	14.9
EICO	63.60	0.20	0.20	2.40	66.70
EIHC	26.60	0.20	0.10	0.20	29.00
EINO	0.90	35.70	27.90	8.80	1.30
EINOX	2.45	38.59	30.23	10.19	2.33
SMOKE	3.7	4.7	4.5	1.7	1.7
FARGAS	0.01027	0.02021	0.01856	0.01154	0.01022
CEFF	96.20	99.98	99.98	99.92	95.91
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1322.	19441.	15333.	5154.	1255.
EICOK	69.10	0.23	0.23	2.71	71.56
EIHCK	34.65	0.29	0.14	0.28	36.19
EINOXK	2.51	37.94	30.30	10.23	2.44

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.782	79.8
EPAPHC	0.387	39.5
EPAPNOX	0.590	60.2

MAX SMOKE = 4.7

APPENDIX B

EMISSIONS TEST SUMMARY SHEETS FOR CF6-50C2 ENGINES WITH JET A FUEL.

This appendix contains emissions test summary sheets from tests of six CF6-50C2 model engines on Jet A fuel. Data from tests of the following engines are included:

October 12, 1979	ESN 517-597
October 19, 1979	ESN 517-602
October 26, 1979	ESN 517-608
November 26, 1979	ESN 517-628
November 29, 1979	ESN 517-629
December 5, 1979	ESN 517-635

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/12/79 CF6-50C2 ESN 517-597 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
PIG	9.	10.	11.	12.	13.
FN, LB	1720.	51897.	43521.	15547.	1776.
T2, F	61.6	60.7	60.5	60.4	60.2
HUM, GR/LB	54.	44.	44.	44.	44.
PAMB, PSIA	14.261	14.266	14.268	14.270	14.275
P2, PSIA	14.253	14.115	14.131	14.211	14.268
W2, PPS	276.	1505.	1389.	839.	280.
T3, F	313.	1025.	952.	671.	316.
P3, PSIA	40.4	427.5	362.3	166.9	41.1
W36, PPS	27.9	217.2	190.3	102.0	28.7
WFE, PPH	1274.	18682.	14822.	5058.	1246.
FAR4	0.01279	0.02406	0.02179	0.01388	0.01213
FAR8	0.01053	0.01928	0.01758	0.01136	0.00972
XNL, RPM	809.	3821.	3491.	2323.	836.
XNH, RPM	6248.	10295.	9962.	8711.	6248.
EMISSION DATA					
CO, PPM	938.2	12.1	10.8	55.9	926.4
CO2, PCT	1.990	4.180	3.850	2.460	1.860
HC, PPM	952.9	17.1	16.1	13.2	1077.1
NO, PPM	7.3	406.6	295.9	60.7	7.6
NOX, PPM	15.4	436.0	323.0	73.0	14.5
EICO	86.60	0.60	0.60	4.50	90.30
EIHC	51.50	0.50	0.50	0.60	61.50
EINO	1.10	33.50	26.40	8.30	1.20
EINOX	2.38	35.91	28.82	10.02	2.37
SMOKE	5.7	2.4	1.8	2.4	4.8
FARGAS	0.01034	0.01966	0.01812	0.01170	0.00979
CEFF	93.50	99.94	99.94	99.84	92.54
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1306.	19373.	15359.	5210.	1278.
EICOK	84.84	0.59	0.59	4.57	89.90
EIHCK	51.87	0.49	0.49	0.63	63.28
EINOXK	2.48	36.55	29.22	9.90	2.38

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.976	99.5
EPAPHC	0.608	62.0
EPAPNOX	0.570	58.2

MAX SMOKE = 5.7

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/12/79 CF6-50C2 ESN 517-597 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	9.	10.	11.	12.	13.
FNK, LB	1720.	51897.	43521.	15547.	1776.
T2, F	61.6	60.7	60.5	60.4	60.2
HUM, GR/LB	54.	44.	44.	44.	44.
BARO, PSIA	14.261	14.266	14.268	14.270	14.275
P2, PSIA	14.253	14.115	14.131	14.211	14.268
W2, PPS	276.	1505.	1389.	839.	280.
T3, F	313.	1025.	952.	671.	316.
P3, PSIA	40.4	427.5	362.3	166.9	41.1
W36, PPS	27.9	217.2	190.3	102.0	28.7
WFE, PPH	1274.	18682.	14822.	5058.	1246.
FAR4	0.01279	0.02406	0.02179	0.01388	0.01213
FAR8	0.01053	0.01928	0.01758	0.01136	0.00972
XNL, RPM	809.	3821.	3491.	2323.	836.
XNH, RPM	6248.	10295.	9962.	8711.	6248.
EMISSION DATA					
CO, PPM	895.5	11.5	10.8	52.3	884.1
CO2, PCT	1.960	4.110	3.770	2.410	1.860
HC, PPM	889.2	19.3	15.8	11.3	1003.3
NO, PPM	7.7	395.3	289.2	59.5	8.1
NOX, PPM	15.7	423.6	316.3	72.4	14.7
EICO	84.00	0.60	0.60	4.30	86.50
EIHC	48.90	0.60	0.50	0.60	57.50
EINO	1.20	33.10	26.30	8.30	1.30
EINOX	2.47	35.47	28.77	10.15	2.41
SMOKE	7.1	2.6	2.4	2.5	4.5
FARGAS	0.01018	0.01933	0.01777	0.01146	0.00976
CEFF	93.79	99.94	99.94	99.85	92.99
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1306.	19373.	15359.	5210.	1278.
EICOK	82.30	0.59	0.59	4.36	86.12
EIHCK	49.25	0.58	0.49	0.63	59.17
EINOXK	2.58	36.10	29.17	10.03	2.42

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.943	96.2
EPAPHC	0.576	58.7
EPAPNOX	0.570	58.1

MAX SMOKE = 7.1

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/19/79 CF6-50C2 ESN 517-602 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	9.	10.	12.	15.	18.
FNK, LB	1674.	52332.	43736.	15605.	1852.
T2, F	72.9	72.1	71.4	71.1	71.1
HUM, GR/LB	72.	72.	72.	72.	72.
BARO, PSIA	14.411	14.413	14.414	14.415	14.416
P2, PSIA	14.404	14.264	14.271	14.353	14.409
W2, PPS	276.	1510.	1390.	838.	277.
T3, F	330.	1056.	980.	694.	329.
P3, PSIA	40.5	435.4	367.0	168.7	40.6
W36, PPS	27.5	218.6	190.8	102.0	27.9
WFE, PPH	1324.	19427.	15296.	5222.	1274.
FAR4	0.01351	0.02495	0.02252	0.01438	0.01279
FAR8	0.01114	0.01988	0.01807	0.01169	0.01054
XNL, RPM	813.	3882.	3536.	2348.	812.
XNH, RPM	6359.	10479.	10098.	8805.	6339.
EMISSION DATA					
CO, PPM	973.9	10.0	8.9	35.3	876.5
CO2, PCT	2.220	4.340	3.980	2.550	2.070
HC, PPM	929.0	20.3	21.9	10.3	753.9
NO, PPM	9.0	408.2	299.4	63.4	9.6
NOX, PPM	16.1	438.8	324.3	74.4	16.0
EICO	81.00	0.50	0.40	2.80	78.70
EIHC	45.70	0.60	0.70	0.50	40.00
EINO	1.30	32.60	26.00	8.50	1.50
EINOX	2.27	35.06	28.18	9.94	2.43
SMOKE	4.0	3.7	3.6	3.3	3.8
FAR [illegible]	0.01139	0.02028	0.01862	0.01203	0.01056
CEF	94.14	99.94	99.93	99.89	94.69
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1325.	19657.	15488.	5635.	1277.
EICOK	82.91	0.53	0.42	3.03	80.45
EIHCK	51.97	0.73	0.83	0.62	45.16
EINOXK	2.40	35.87	28.96	10.06	2.57

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.932	95.0
EPAPHC	0.568	57.9
EPAPNOX	0.576	58.8

MAX SMOKE = 4.0

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/19/79 CF6-50C2 ESN 517-602 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RIG	9.	10.	12.	15.	18.
FNK, LB	1674.	52332.	43736.	15605.	1852.
T2, F	72.9	72.1	71.4	71.1	71.1
HUM, GR/LB	72.	72.	72.	72.	72.
BARO, PSIA	14.411	14.413	14.414	14.415	14.416
P2, PSIA	14.404	14.264	14.271	14.353	14.409
W2, PPS	276.	1510.	1390.	838.	277.
T3, F	330.	1056.	980.	694.	329.
P3, PSIA	40.5	435.4	367.0	168.7	40.6
W36, PPS	27.5	218.6	190.8	102.0	27.9
WFE, PPH	1324.	19427.	15296.	5222.	1274.
FAR4	0.01351	0.02495	0.02252	0.01438	0.01279
FAR8	0.01114	0.01988	0.01807	0.01169	0.01054
XNL, RPM	813.	3882.	3536.	2348.	812.
XNH, RPM	6359.	10479.	10098.	8805.	6339.
EMISSION DATA					
CO, PPM	888.5	9.8	8.9	33.9	837.7
CO2, PCT	2.180	4.230	3.910	2.510	2.060
HC, PPM	784.2	22.5	20.6	9.3	693.4
NO, PPM	11.6	409.4	291.4	55.8	10.4
NOX, PPM	16.6	436.6	317.5	73.7	16.1
EICO	76.00	0.50	0.50	2.70	76.00
EIHC	39.70	0.60	0.60	0.40	37.10
EINO	1.70	33.50	25.80	7.60	1.60
EINOX	2.41	35.73	28.06	9.99	2.47
SMOKE	4.5	3.7	2.1	3.1	3.5
FARGAS	0.01107	0.01979	0.01830	0.01185	0.01045
CEFF	94.78	99.93	99.93	99.90	95.00
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1325.	19657.	15488.	5635.	1277.
EICOK	77.79	0.53	0.53	2.92	77.69
EIHCK	45.15	0.73	0.71	0.50	41.89
EINOXK	2.55	36.56	28.84	10.11	2.61

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.883	90.0
EPAPHC	0.501	51.1
EPAPNOX	0.580	59.1

MAX SMOKE = 4.5

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/26/79 CF6-50C2 ESN 517-608 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	11.	12.	13.	14.	15.
FNK, LB	1732.	51743.	43323.	15528.	1712.
T2, F	37.2	37.3	37.7	38.1	37.4
HUM, GR/LB	19.	19.	19.	19.	19.
BARO, PSIA	14.566	14.567	14.568	14.567	14.568
P2, PSIA	14.599	14.411	14.421	14.506	14.560
W2, PPS	277.	1503.	1388.	840.	279.
T3, F	281.	967.	898.	628.	281.
P3, PSIA	41.4	438.1	369.0	170.7	41.7
W36, PPS	28.8	227.5	197.9	106.4	29.6
WFE, PPH	1318.	18351.	14552.	5021.	1251.
FAR4	0.01272	0.02250	0.02051	0.01315	0.01178
FAR8	0.01051	0.01798	0.01646	0.01079	0.00948
XNL, RPM	790.	3732.	3409.	2269.	810.
XNH, RPM	6161.	10083.	9772.	8585.	6151.
EMISSION DATA					
CO, PPM	968.1	9.7	9.7	88.6	878.8
CO2, PCT	1.930	3.860	3.530	2.270	1.820
HC, PPM	1167.8	34.2	33.6	30.6	1056.7
NO, PPM	5.8	357.1	266.9	48.6	6.8
NOX, PPM	14.8	387.5	292.9	63.2	14.7
EICO	90.60	0.50	0.50	7.80	87.60
EIHC	63.70	1.10	1.10	1.60	61.30
EINO	0.90	31.60	25.70	7.20	1.10
EINOX	2.32	34.27	28.25	9.31	2.45
SMOKE	6.1	3.8	3.8	4.3	5.9
FARGAS	0.01026	0.01829	0.01674	0.01090	0.00964
CEFF	92.35	99.90	99.89	99.68	92.63
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1360.	19154.	15175.	5197.	1291.
EICOK	82.95	0.43	0.43	7.19	80.49
EIHCK	51.05	0.71	0.73	1.24	49.12
EINOXK	2.33	36.38	29.70	9.31	2.45

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.979	99.8
EPAPHC	0.586	59.8
EPAPNOX	0.565	57.6

MAX SMOKE = 6.1

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/26/79 CF6-50C2 ESN 517-608 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	11.	12.	13.	14.	15.
FNK, LB	1732.	51743.	43323.	15528.	1712.
T2, F	37.2	37.3	37.7	38.1	37.4
HUM, GR/LB	19.	19.	19.	19.	19.
BARO, PSIA	14.566	14.567	14.568	14.567	14.568
P2, PSIA	14.599	14.411	14.421	14.506	14.560
W2, PPS	277.	1503.	1388.	840.	279.
T3, F	281.	967.	898.	628.	281.
P3, PSIA	41.4	438.1	369.0	170.7	41.7
W36, PPS	28.8	227.5	197.9	106.4	29.6
WFE, PPH	1318.	18351.	14552.	5021.	1251.
FAR4	0.01272	0.02250	0.02051	0.01315	0.01178
FAR8	0.01051	0.01798	0.01646	0.01079	0.00948
XNL, RPM	790.	3732.	3409.	2269.	810.
XNH, RPM	6161.	10083.	9772.	8585.	6151.
EMISSION DATA					
CO, PPM	935.3	9.2	9.0	85.6	871.9
CO2, PCT	1.900	3.800	3.490	2.220	1.800
HC, PPM	1120.7	34.8	31.3	28.7	1002.9
NO, PPM	6.5	3532.5	265.8	47.2	7.1
NOX, PPM	14.7	385.2	290.6	61.0	14.6
EICO	89.10	0.50	0.50	7.70	88.20
EIHC	62.20	1.10	1.10	1.50	59.10
EINO	1.00	31.70	25.90	7.10	1.20
EINOX	2.34	34.61	28.30	9.19	2.47
SMOKE	6.8	4.7	2.9	4.0	5.5
FARGAS	0.01007	0.01800	0.01658	0.01066	0.00949
CEFF	92.51	99.89	99.90	99.69	92.81
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1360.	19154.	15175.	5197.	1291.
EICOK	81.57	0.43	0.43	7.10	81.04
EIHCK	49.85	0.71	0.73	1.16	47.36
EINOXK	2.35	36.74	29.76	9.19	2.47

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.968	98.7
EPAPHC	0.571	58.2
EPAPNOX	0.566	57.8

MAX SMOKE = 6.8

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 11/26/79 CF6-50C2 ESN 517-628 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	9.	10.	11.	12.	13.
FNK, LB	1685.	51467.	43252.	15806.	1678.
T2, F	51.5	49.8	51.4	51.4	51.1
HUM, GR/LB	29.	28.	28.	28.	28.
BARO, PSIA	14.288	14.286	14.286	14.285	14.285
P2, PSIA	14.278	14.131	14.137	14.220	14.277
W2, PPS	279.	1494.	1380.	844.	280.
T3, F	306.	1005.	934.	659.	305.
P3, PSIA	40.8	428.7	362.4	168.5	41.0
W36, PPS	28.6	224.3	195.7	105.8	29.5
WFE, PPH	1326.	18356.	14596.	5039.	1226.
FAR4	0.01295	0.02285	0.02082	0.01329	0.01160
FAR8	0.01037	0.01863	0.01703	0.01115	0.00901
XNL, RPM	807.	3780.	3454.	2303.	825.
XNH, RPM	6254.	10226.	9892.	8657.	6206.
EMISSION DATA					
CO, PPM	948.0	11.0	9.7	58.1	896.2
CO2, PCT	2.010	4.000	3.700	2.380	1.790
HC, PPM	1029.3	22.0	21.0	18.7	1082.6
NO, PPM	5.2	383.7	286.6	59.3	5.7
NOX, PPM	15.6	413.0	311.4	72.1	14.3
EICO	86.30	0.60	0.50	4.90	90.40
EIHC	54.80	0.70	0.70	0.90	63.70
EINO	0.80	32.80	26.50	8.40	1.00
EINOX	2.38	35.35	28.78	10.21	2.41
SMOKE	3.8	3.8	2.6	3.1	4.3
FARGAS	0.01052	0.01891	0.01749	0.01135	0.00905
CEFF	93.23	99.93	99.93	99.81	92.36
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1373.	19256.	15282.	5242.	1270.
EICOK	83.49	0.56	0.47	4.85	87.46
EIHCK	52.50	0.59	0.60	0.87	60.59
EINOXK	2.35	35.86	29.00	9.87	2.37

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.998	101.1
EPAPHC	0.629	64.1
EPAPNOX	0.562	57.3

MAX SMOKE = 4.3

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 11/26/79 CF6-50C2 ESN 517-628 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	9.	10.	11.	12.	13.
FNK, LB	1685.	51467.	43252.	15806.	1678.
T2, F	51.5	49.8	51.4	51.4	51.1
HUM, GR/LB	29.	28.	28.	28.	28.
BARO, PSIA	14.288	14.286	14.286	14.285	14.285
P2, PSIA	14.278	14.131	14.137	14.220	14.277
W2, PPS	279.	1494.	1380.	844.	280.
T3, F	306.	1005.	934.	659.	305.
P3, PSIA	40.8	428.7	362.4	168.5	41.0
W36, PPS	28.6	224.3	195.7	105.8	29.5
WFE, PPH	1326.	18356.	14596.	5039.	1226.
FAR4	0.01295	0.02285	0.02082	0.01329	0.01160
FAR8	0.01037	0.01863	0.01703	0.01115	0.00901
XNL, RPM	807.	3780.	3454.	2303.	825.
XNH, RPM	6254.	10226.	9892.	8657.	6206.
EMISSION DATA					
CO, PPM	891.0	10.4	9.9	55.4	868.5
CO2, PCT	1.980	3.940	3.620	2.330	1.800
HC, PPM	986.0	21.3	20.7	18.1	1032.7
NO, PPM	7.6	380.3	283.2	58.3	7.6
NOX, PPM	15.8	410.7	308.1	70.6	14.9
EICO	82.40	0.50	0.60	4.80	87.40
EIHC	53.30	0.60	0.70	0.90	60.60
EINO	1.20	33.00	26.70	8.40	1.30
EINOX	2.45	35.64	29.04	10.19	2.51
SMOKE	4.8	3.8	2.6	1.3	3.8
FARGAS	0.01036	0.01865	0.01714	0.01114	0.00953
CEFF	93.45	99.93	99.93	99.81	92.69
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1373.	19256.	15282.	5242.	1270.
EICOK	79.72	0.47	0.56	4.75	84.55
EIHCK	51.06	0.51	0.60	0.87	57.64
EINOXK	2.41	36.16	29.26	9.85	2.47

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.951	97.0
EPAPHC	0.608	62.0
EPAPNOX	0.567	57.8

MAX SMOKE = 4.8

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 11/29/79 CF6-50C2 ESN 517-629 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	11.	12.	13.	14.
FNK, LB	1639.	51269.	42986.	15220.	1617.
T2, F	27.9	26.8	26.7	27.8	27.7
HUM, GR/LB	19.	19.	19.	19.	19.
BARO, PSIA	14.503	14.503	14.504	14.504	14.503
P2, PSIA	14.496	14.341	14.352	14.444	14.495
W2, PPS	278.	1491.	1376.	830.	277.
T3, F	275.	938.	870.	603.	271.
P3, PSIA	41.6	434.6	365.7	169.0	41.7
W36, PPS	28.9	228.1	198.1	106.5	29.6
WFE, PPH	1328.	17916.	14232.	4905.	1268.
FAR4	0.01279	0.02192	0.02004	0.01283	0.01193
FARS	0.01062	0.01801	0.01646	0.01077	0.00994
XNL, RPM	788.	3688.	3371.	2238.	786.
XNH, RPM	6159.	10036.	9704.	8437.	6119.
EMISSION DATA					
CO, PPM	1004.8	6.8	6.8	128.7	952.6
CO2, PCT	2.010	3.810	3.510	2.250	1.880
HC, PPM	1149.2	22.3	18.7	30.7	1082.3
NO, PPM	5.2	329.6	248.3	38.2	4.3
NOX, PPM	15.0	370.2	267.5	54.6	13.8
EICO	90.70	0.40	0.40	11.40	91.80
EIHC	60.50	0.70	0.60	1.60	60.80
EINO	0.80	29.50	24.10	5.70	0.70
EINOX	2.26	33.19	25.94	8.11	2.22
SMOKE	8.3	2.9	3.8	5.6	8.7
FARGAS	0.01063	0.01804	0.01665	0.01082	0.00996
CEFF	92.62	99.93	99.94	99.60	92.58
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1391.	19015.	15095.	5156.	1328.
EICOK	82.00	0.32	0.32	9.82	82.27
EIHCK	46.45	0.37	0.32	1.03	45.36
EINOXK	2.29	37.49	28.97	8.57	2.27

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	1.014	103.4
EPAPHC	0.543	55.3
EPAPNOX	0.553	56.4

MAX SMOKE = 8.7

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 11/29/79 CF6-50C2 ESN 517-629 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	11.	12.	13.	14.
FNK, LB	1639.	51269.	42986.	15220.	1617.
T2, F	27.9	26.8	26.7	27.8	27.7
HUM, GR/LB	19.	19.	19.	19.	19.
BARO, PSIA	14.503	14.503	14.504	14.504	14.503
P2, PSIA	14.496	14.341	14.352	14.444	14.495
W2, PPS	278.	1491.	1376.	830.	277.
T3, F	275.	938.	870.	603.	271.
P3, PSIA	41.6	434.6	365.7	169.0	41.7
W36, PPS	28.9	228.1	198.1	106.5	29.6
WFE, PPH	1328.	17916.	14232.	4905.	1268.
FAR4	0.01279	0.02192	0.02004	0.01283	0.01193
FAR8	0.01062	0.01801	0.01646	0.01077	0.00994
XNL, RPM	788.	3688.	3371.	2238.	786.
XNH, RPM	6159.	10036.	9704.	8437.	6119.
EMISSION DATA					
CO, PPM	989.7	6.5	6.5	118.9	948.9
CO2, PCT	1.930	3.770	3.480	2.210	1.840
HC, PPM	1236.0	19.4	19.0	26.7	1122.4
NO, PPM	6.3	326.2	244.9	38.5	5.8
NOX, PPM	13.9	366.8	284.4	53.3	13.9
EICO	92.10	0.30	0.40	10.70	92.90
EIHC	67.00	0.60	0.60	1.40	64.00
EINO	1.00	29.50	23.90	5.80	0.90
EINOX	2.16	33.18	27.79	8.05	2.27
SMOKE	8.4	4.5	4.9	3.8	7.9
FARGAS	0.01032	0.01787	0.01652	0.01063	0.00981
CEFF	92.02	99.94	99.93	99.63	92.27
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1391.	19015.	15095.	5156.	1328.
EICOK	83.27	0.24	0.32	9.22	83.25
EIHCK	51.44	0.31	0.32	0.91	47.75
EINOXK	2.19	37.48	31.04	8.50	2.32

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	1.023	104.3
EPAPHC	0.591	60.3
EPAPNOX	0.574	58.6

MAX SMOKE = 8.4

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 12/5/79 CF6-50C2 ESN 517-635 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	11.	12.	13.	14.
FNK, LB	1735.	51547.	43067.	15385.	1782.
T2, F	56.8	57.9	57.9	58.7	58.6
HUM, GR/LB	20.	20.	20.	20.	20.
BARO, PSIA	14.262	14.256	14.256	14.257	14.256
P2, PSIA	14.255	14.091	14.111	14.195	14.242
W2, PPS	278.	1493.	1378.	830.	278.
T3, F	315.	1015.	944.	667.	316.
P3, PSIA	40.6	425.0	358.2	165.4	41.0
W36, PPS	28.4	221.2	192.3	103.2	29.2
WFE, PPH	1308.	18359.	14633.	5013.	1245.
FAR4	0.01283	0.02314	0.02121	0.01354	0.01187
FAR8	0.01065	0.01869	0.01716	0.01124	0.00991
XNL, RPM	812.	3795.	3471.	2312.	816.
XNH, RPM	6297.	10305.	9955.	8675.	6291.
EMISSION DATA					
CO, PPM	927.8	15.3	13.7	63.3	870.1
CO2, PCT	2.020	4.000	3.620	2.330	1.820
HC, PPM	917.6	36.5	37.4	34.5	910.8
NO, PPM	6.9	405.8	301.2	63.4	7.2
NOX, PPM	16.3	433.9	327.1	76.2	16.2
EICO	84.30	0.80	0.80	5.40	87.30
EIHC	48.60	1.10	1.20	1.70	53.20
EINO	1.00	34.70	28.30	9.10	1.20
EINOX	2.48	37.07	30.76	10.97	2.72
SMOKE	5.3	2.3	1.5	4.1	3.8
FARGAS	0.01056	0.01894	0.01718	0.01116	0.00957
CEFF	93.80	99.89	99.88	99.72	93.34
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1350.	19166.	15248.	5188.	1283.
EICOK	83.21	0.76	0.77	5.40	86.81
EIHCK	49.65	1.00	1.10	1.74	54.74
EINOXK	2.35	36.18	29.85	10.28	2.56

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.986	100.5
EPAPHC	0.596	60.8
EPAPNOX	0.574	58.5

MAX SMOKE = 5.3

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 12/5/79 CF6-50C2 ESN 517-635 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	11.	12.	13.	14.
FNK, LB	1735.	51547.	43067.	15385.	1782.
T2, F	56.8	57.9	57.9	58.7	58.6
HUM, GR/LB	20.	20.	20.	20.	20.
BARO, PSIA	14.262	14.256	14.256	14.257	14.256
P2, PSIA	14.255	14.091	14.111	14.195	14.242
W2, PPS	278.	1493.	1378.	830.	278.
T3, F	315.	1015.	944.	667.	316.
P3, PSIA	40.6	425.0	358.2	165.4	41.0
W36, PPS	28.4	221.2	192.3	103.2	29.2
WFE, PPH	1308.	18359.	14633.	5013.	1245.
FAR4	0.01283	0.02314	0.02121	0.01354	0.01187
FAR8	0.01065	0.01869	0.01716	0.01124	0.00991
XNL, RPM	812.	3795.	3471.	2312.	816.
XNH, RPM	6297.	10305.	9955.	8675.	6291.
EMISSION DATA					
CO, PPM	880.7	14.4	13.3	63.8	842.2
CO2, PCT	2.000	3.930	3.590	2.280	1.840
HC, PPM	840.0	37.1	36.5	33.6	826.5
NO, PPM	8.5	397.9	297.9	62.1	9.5
NOX, PPM	16.6	424.9	322.6	74.0	16.4
EICO	81.40	0.70	0.70	5.60	84.20
EIHC	45.30	1.10	1.20	1.70	48.10
EINO	1.30	34.60	28.30	9.10	1.60
EINOX	2.56	36.93	30.62	10.88	2.75
SMOKE	7.3	5.1	1.3	1.3	4.4
FARGAS	0.01038	0.01861	0.01702	0.01092	0.00960
CEFF	94.16	99.89	99.88	99.72	93.85
CORRECTED DATA					
T3RF, F	312.	1029.	956.	664.	312.
P3RF, PSIA	42.3	438.6	368.0	167.9	42.3
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1350.	19166.	15248.	5188.	1283.
EICOK	80.35	0.67	0.67	5.60	83.73
EIHCK	46.28	1.00	1.10	1.74	49.49
EINOXK	2.42	36.04	29.71	10.19	2.59

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.953	97.2
EPAPHC	0.553	56.4
EPAPNOX	0.572	58.3

MAX SMOKE = 7.3

APPENDIX C

EMISSIONS TEST SUMMARY SHEETS FOR CF6-6D ENGINES WITH JET A FUEL.

This appendix contains emissions test summary sheets from tests of seven CF6-6D model engines on Jet A fuel. Data from tests of the following engines are included:

August 16, 1979	ESN 451-553
August 24, 1979	ESN 451-554
August 28, 1979	ESN 451-555
October 3, 1979	ESN 451-558
October 30, 1979	ESN 451-560
November 13, 1979	ESN 451-562
November 19, 1979	ESN 451-563

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 8/16/79 CF6-6D ESN 451-553 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	12.	13.	15.	18.	21.
FNK, LB	1322.	40163.	33813.	12400.	1432.
T2, F	70.0	70.8	71.0	71.0	72.0
HUM, GR/LB	49.	50.	50.	50.	50.
BARO, PSIA	14.587	14.578	14.574	14.571	14.568
P2, PSIA	14.580	14.453	14.461	14.523	14.560
W2, PPS	245.	1302.	1196.	731.	243.
T3, F	299.	951.	895.	639.	303.
P3, PSIA	38.2	357.5	310.0	147.8	38.2
W36, PPS	22.8	162.3	141.9	78.9	22.9
WFE, PPH	978.	13988.	11416.	3927.	956.
FAR4	0.01200	0.02410	0.02250	0.01390	0.01170
FAR8	0.00980	0.01970	0.01830	0.01130	0.00950
XNL, RPM	723.	3457.	3243.	2112.	724.
XNH, RPM	5656.	9620.	9344.	8235.	5659.
EMISSION DATA					
CO, PPM	662.9	9.4	8.0	64.5	667.9
CO2, PCT	1.710	4.590	4.170	2.550	1.730
HC, PPM	559.5	4.9	2.6	4.9	512.5
NO, PPM	7.5	489.0	357.3	73.5	6.0
NOX, PPM	15.3	524.5	388.3	89.0	15.4
EICO	72.40	0.40	0.40	5.10	72.40
EIHC	35.80	0.10	0.10	0.	32.50
EINO	1.40	36.90	29.60	9.80	1.10
EINOX	2.80	39.57	32.13	11.84	2.80
SMOKE	6.2	5.6	4.8	2.2	5.0
FARGAS	0.00873	0.02151	0.01957	0.01209	0.00880
CEFF	95.20	99.98	99.98	99.86	95.48
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	973.	14010.	11427.	3914.	950.
EICOK	70.84	0.40	0.40	5.20	71.55
EIHCK	35.80	0.10	0.10	0.	33.44
EINOXK	2.88	40.02	32.62	11.84	2.87

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.798	81.3
EPAPHC	0.377	38.4
EPAPNOX	0.624	63.6

MAX SMOKE = 6.2

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 8/16/79 CF6-6D ESN 451-553 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	12.	13.	15.	18.	21.
FNK, LB	1322.	40163.	33813.	12400.	1432.
T2, F	70.0	70.8	71.0	71.0	72.0
HUM, GR/LB	49.	50.	50.	50.	50.
BARO, PSIA	14.587	14.578	14.574	14.571	14.568
P2, PSIA	14.580	14.453	14.461	14.523	14.560
W2, PPS	245.	1302.	1196.	731.	243.
T3, F	299.	951.	895.	639.	303.
P3, PSIA	38.2	357.5	310.0	147.8	38.2
W36, PPS	22.8	162.3	141.9	78.9	22.9
WFE, PPH	978.	13988.	11416.	3927.	956.
FAR4	0.01200	0.02410	0.02250	0.01390	0.01170
FAR8	0.00980	0.01970	0.01830	0.01130	0.00950
XNL, RPM	723.	3457.	3243.	2112.	724.
XNH, RPM	5656.	9620.	9344.	8235.	5659.
EMISSION DATA					
CO, PPM	629.2	8.5	7.5	54.6	611.9
CO2, PCT	1.550	4.380	3.960	2.350	1.570
HC, PPM	532.7	4.0	2.3	5.2	483.7
NO, PPM	8.8	470.7	344.7	68.9	6.7
NOX, PPM	13.5	508.5	372.2	83.5	13.6
EICO	75.90	0.40	0.40	4.70	73.30
EIHC	37.60	0.10	0.10	0.20	33.90
EINO	1.80	37.20	30.00	9.90	1.40
EINOX	2.73	40.14	32.35	12.02	2.73
SMOKE	5.1	5.6	5.2	2.7	4.1
FARGAS	0.00791	0.02053	0.01862	0.01116	0.00797
CEFF	94.96	99.98	99.99	99.87	95.34
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	973.	14010.	11427.	3914.	950.
EICOK	74.27	0.40	0.40	4.79	72.44
EIHCK	37.60	0.10	0.10	0.21	34.88
EINOXK	2.81	40.60	32.84	12.02	2.80

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.824	84.1
EPAPHC	0.396	40.4
EPAPNOX	0.629	64.1

MAX SMOKE = 5.6

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 8/24/79 CF6-6D ESN 451-554 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	16.	17.	13.	15.
FNK, LB	1380.	39173.	33071.	11940.	1409.
T2, F	78.6	76.2	75.2	77.4	77.3
HUM, GR/LB	88.	88.	88.	88.	88.
BARO, PSIA	14.383	14.388	14.389	14.384	14.386
P2, PSIA	14.378	14.259	14.270	14.335	14.380
W2, PPS	244.	1297.	1197.	733.	244.
T3, F	313.	954.	898.	650.	309.
P3, PSIA	37.0	351.5	307.0	144.9	37.3
W36, PPS	21.6	155.6	140.5	77.3	22.1
WFE, PPH	974.	13612.	11189.	3821.	944.
FAR4	0.01270	0.02460	0.02240	0.01390	0.01200
FAR8	0.01030	0.02000	0.01820	0.01130	0.00980
XNL, RPM	720.	3457.	3250.	2110.	721.
XNH, RPM	5755.	9694.	9411.	8312.	5709.
EMISSION DATA					
CO, PPM	635.6	9.1	7.6	72.4	668.9
CO2, PCT	1.810	4.750	4.270	2.670	1.760
HC, PPM	482.9	2.6	1.9	7.8	560.8
NO, PPM	6.6	428.5	306.7	62.5	6.6
NOX, PPM	14.3	464.6	339.4	77.5	13.3
EICO	66.30	0.40	0.40	5.40	71.10
EIHC	29.80	0.10	0.	0.30	35.20
EINO	1.20	31.50	25.00	8.00	1.20
EINOX	2.53	34.20	27.64	9.92	2.40
SMOKE	2.5	1.9	3.2	1.7	3.1
FARGAS	0.00907	0.02206	0.01989	0.01257	0.00889
CEFF	95.87	99.99	99.99	99.84	95.28
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	971.	13709.	11272.	3824.	942.
EICOK	66.12	0.40	0.40	5.61	70.48
EIHCK	32.93	0.11	0.	0.35	37.81
EINOXK	2.85	38.32	31.00	10.82	2.71

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.757	77.2
EPAPHC	0.366	37.3
EPAPNOX	0.582	59.4

MAX SMOKE = 3.2

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 8/24/79 CF6-6D ESN 451-554 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	16.	17.	13.	15.
FNK, LB	1380.	39173.	33071.	11940.	1409.
T2, F	78.6	76.2	75.2	77.4	77.3
HUM, GR/LB	88.	88.	88.	88.	88.
BARO, PSIA	14.383	14.388	14.389	14.384	14.386
P2, PSIA	14.378	14.259	14.270	14.335	14.380
W2, PPS	244.	1297.	1197.	733.	244.
T3, F	313.	954.	898.	650.	309.
P3, PSIA	37.0	351.5	307.0	144.9	37.3
W36, PPS	21.6	155.6	140.5	77.3	22.1
WFE, PPH	974.	13612.	11189.	3821.	944.
FAR4	0.01270	0.02460	0.02240	0.01390	0.01200
FAR8	0.01030	0.02000	0.01820	0.01130	0.00980
XNL, RPM	720.	3457.	3250.	2110.	721.
XNH, RPM	5755.	9694.	9411.	8312.	5709.
EMISSION DATA					
CO, PPM	582.3	8.4	7.4	63.6	602.9
CO2, PCT	1.700	4.530	4.040	2.410	1.620
HC, PPM	450.6	2.3	1.6	6.5	499.7
NO, PPM	8.8	404.8	287.6	57.1	6.8
NOX, PPM	13.2	438.7	331.5	70.2	12.5
EICO	64.70	0.40	0.40	5.30	70.00
EIHC	29.60	0.10	0.	0.30	34.20
EINO	1.70	31.20	24.70	8.10	1.30
EINOX	2.48	33.79	28.51	9.94	2.46
SMOKE	4.3	2.5	1.8	3.1	3.3
FARGAS	0.00852	0.02105	0.01882	0.01134	0.00816
CEFF	95.92	99.99	99.99	99.85	95.39
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	971.	13709.	11272.	3824.	942.
EICOK	64.52	0.40	0.40	5.50	69.39
EIHCK	32.71	0.11	0.	0.35	36.73
EINOXK	2.79	37.86	31.98	10.84	2.78

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.741	75.5
EPAPHC	0.361	36.9
EPAPNOX	0.590	60.2

MAX SMOKE = 4.3

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 8/28/79 CF6-6D ESN 451-555 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	11.	12.	13.	14.	15.
FNK, LB	1456.	39192.	33364.	11949.	1507.
T2, F	81.2	81.7	80.7	80.6	79.9
HUM, GR/LB	104.	104.	104.	105.	107.
BARO, PSIA	14.393	14.393	14.392	14.389	14.388
P2, PSIA	14.387	14.262	14.276	14.345	14.378
W2, PPS	254.	1290.	1196.	730.	251.
T3, F	322.	960.	912.	649.	320.
P3, PSIA	39.3	351.1	310.0	145.6	39.8
W36, PPS	23.1	155.0	141.7	77.7	23.9
WFE, PPH	1009.	13746.	11405.	3861.	973.
FAR4	0.01230	0.02500	0.02270	0.01400	0.01150
FAR8	0.01000	0.02030	0.01850	0.01140	0.00940
XNL, RPM	784.	3481.	3283.	2128.	788.
XNH, RPM	5808.	9706.	9458.	8309.	5788.
EMISSION DATA					
CO, PPM	601.2	10.3	8.5	70.6	616.8
CO2, PCT	1.760	4.680	4.150	2.560	1.650
HC, PPM	477.9	2.9	1.6	7.1	540.1
NO, PPM	6.1	476.3	328.1	62.5	6.8
NOX, PPM	14.3	512.5	360.9	78.0	13.9
EICO	64.70	0.40	0.40	5.50	69.90
EIHC	30.50	0.10	0.	0.30	36.20
EINO	1.10	35.60	27.60	8.40	1.30
EINOX	2.61	38.36	30.33	10.43	2.67
SMOKE	4.5	2.7	1.0	2.1	1.9
FARGAS	0.00876	0.02168	0.01926	0.01202	0.00832
CEFF	95.84	99.98	99.99	99.84	95.22
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1001.	13752.	11408.	3846.	968.
EICOK	68.01	0.41	0.42	5.71	73.58
EIHCK	35.95	0.11	0.	0.34	42.06
EINOXK	2.94	44.34	34.39	11.91	3.03

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.803	81.9
EPAPHC	0.414	42.2
EPAPNOX	0.657	67.0

MAX SMOKE = 4.5

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 8/28/79 CF6-6D ESN 451-555 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	11.	12.	13.	14.	15.
FNK, LB	1456.	39192.	33364.	11949.	1507.
T2, F	81.2	81.7	80.7	80.6	79.9
HUM, GR/LB	104.	104.	104.	105.	107.
BARO, PSIA	14.393	14.393	14.392	14.389	14.388
P2, PSIA	14.387	14.262	14.276	14.345	14.378
W2, PPS	254.	1290.	1196.	730.	251.
T3, F	322.	960.	912.	649.	320.
P3, PSIA	39.3	351.1	310.0	145.6	39.8
W36, PPS	23.1	155.0	141.7	77.7	23.9
WFE, PPH	1009.	13746.	11405.	3861.	973.
FAR4	0.01230	0.02500	0.02270	0.01400	0.01150
FAR8	0.01000	0.02030	0.01850	0.01140	0.00940
XNL, RPM	784.	3481.	3283.	2128.	788.
XNH, RPM	5808.	9706.	9458.	8309.	5788.
EMISSION DATA					
CO, PPM	574.1	8.9	7.7	61.2	578.0
CO2, PCT	1.640	4.380	3.940	2.370	1.540
HC, PPM	463.2	1.9	1.9	6.5	501.3
NO, PPM	7.3	432.2	313.4	58.4	7.4
NOX, PPM	13.7	469.5	342.8	71.8	13.1
EICO	66.20	0.40	0.40	5.20	70.30
EIHC	31.60	0.	0.10	0.30	36.10
EINO	1.40	34.50	27.70	8.40	1.50
EINOX	2.69	37.52	30.31	10.37	2.70
SMOKE	3.0	2.6	2.5	2.0	1.2
FARGAS	0.00818	0.02028	0.01829	0.01113	0.00775
CEFF	95.71	99.91	99.99	99.85	95.22
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1001.	13752.	11408.	3846.	968.
EICOK	69.59	0.41	0.42	5.40	74.00
EIHCK	37.24	0.	0.12	0.34	41.94
EINOXK	3.03	43.37	34.37	11.84	3.07

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.815	83.1
EPAPHC	0.424	43.3
EPAPNOX	0.653	66.6

MAX SMOKE = 3.0

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/3/79 CF6-6D ESN 451-558 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	11.	12.	13.	14.
FNK, LB	1379.	39639.	33562.	12041.	1416.
T2, F	62.5	62.3	61.6	61.7	61.6
HUM, GR/LB	56.	56.	61.	61.	61.
BARO, PSIA	14.377	14.379	14.379	14.380	14.380
P2, PSIA	14.373	14.249	14.265	14.337	14.375
W2, PPS	247.	1290.	1195.	726.	249.
T3, F	290.	934.	884.	622.	289.
P3, PSIA	38.1	353.3	312.2	145.6	38.4
W36, PPS	23.1	157.1	139.6	76.1	22.4
WFE, PPH	988.	13518.	11209.	3774.	936.
FAR4	0.01200	0.02410	0.02250	0.01390	0.01170
FAR8	0.00980	0.01970	0.01830	0.01130	0.00950
XNL, RPM	746.	3419.	3223.	2083.	747.
XNH, RPM	5616.	9512.	9264.	8146.	5587.
EMISSION DATA					
CO, PPM	847.9	11.1	9.1	82.4	867.0
CO2, PCT	1.840	4.480	4.060	2.480	1.690
HC, PPM	813.7	2.6	1.3	9.0	890.4
NO, PPM	5.6	442.6	326.3	59.5	6.6
NOX, PPM	14.1	486.2	355.4	73.6	13.0
EICO	84.70	0.50	0.50	6.60	93.20
EIHC	47.70	0.10	0.	0.40	56.10
EINO	0.90	34.20	27.70	8.10	1.20
EINOX	2.38	37.57	30.21	10.05	2.36
SMOKE	8.5	5.5	4.8	1.8	6.9
FARGAS	0.00953	0.02098	0.01904	0.01178	0.00886
CEFF	93.87	99.98	99.99	99.81	92.95
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1011.	13856.	11558.	3876.	959.
EICOK	80.93	0.48	0.49	6.40	89.17
EIHCK	44.73	0.09	0.	0.38	52.23
EINOXK	2.55	40.16	32.22	10.77	2.56

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.963	98.2
EPAPHC	0.516	52.6
EPAPNOX	0.612	62.4

MAX SMOKE = 8.5

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/3/79 CF6-6D ESN 451-558 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	11.	12.	13.	14.
FNK, LB	1379.	39639.	33562.	12041.	1416.
T2, F	62.5	62.3	61.6	61.7	61.6
HUM, GR/LB	56.	56.	61.	61.	61.
BARO, PSIA	14.377	14.379	14.379	14.380	14.380
P2, PSIA	14.373	14.249	14.265	14.337	14.375
W2, PPS	247.	1290.	1195.	726.	249.
T3, F	290.	934.	884.	622.	289.
P3, PSIA	38.1	353.3	312.2	145.6	38.4
W36, PPS	23.1	157.1	139.6	76.1	22.4
WFE, PPH	988.	13518.	11209.	3774.	936.
FAR4	0.01200	0.02410	0.02250	0.01390	0.01170
FAR8	0.00980	0.01970	0.01830	0.01130	0.00950
XNL, RPM	746.	3419.	3223.	2083.	747.
XNH, RPM	5616.	9512.	9264.	8146.	5587.
EMISSION DATA					
CO, PPM	758.0	10.7	8.7	65.2	745.2
CO2, PCT	1.670	4.180	3.790	2.160	1.560
HC, PPM	723.7	2.3	1.3	7.1	717.0
NO, PPM	5.6	416.9	305.1	52.5	6.1
NOX, PPM	12.9	450.4	330.8	64.9	12.4
EICO	83.50	0.50	0.50	6.00	87.70
EIHC	46.80	0.10	0.	0.40	49.40
EINO	1.00	34.40	27.70	8.20	1.20
EINOX	2.40	37.22	30.02	10.14	2.45
SMOKE	7.9	9.4	3.3	2.1	5.7
FARGAS	0.00865	0.01960	0.01782	0.01027	0.00810
CEFF	93.99	99.98	99.99	99.83	93.66
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	1011.	13856.	11558.	3876.	959.
EICOK	79.78	0.48	0.49	5.82	83.91
EIHCK	43.89	0.09	0.	0.38	45.99
EINOXK	2.57	39.78	32.02	10.87	2.65

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.935	95.3
EPAPHC	0.491	50.1
EPAPNOX	0.609	62.1

MAX SMOKE = 9.4

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/30/79 CF6-6D ESN 451-560 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA

POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	10.	13.	15.	18.	21.
FNK, LB	1331.	39743.	33622.	11970.	1392.
T2, F	59.1	61.8	61.8	64.2	66.8
HUM, GR/LB	41.	43.	44.	45.	45.
BARO, PSIA	14.496	14.494	14.494	14.487	14.481
P2, PSIA	14.488	14.363	14.381	14.440	14.473
W2, PPS	250.	1297.	1197.	729.	250.
T3, F	291.	931.	876.	626.	299.
P3, PSIA	39.2	356.7	311.9	146.8	39.2
W36, PPS	23.4	160.5	145.9	79.3	23.4
WFE, PPH	981.	13494.	11219.	3799.	973.
FAR4	0.01170	0.02350	0.02150	0.01340	0.01160
FAR8	0.00950	0.01910	0.01750	0.01090	0.00940
XNL, RPM	753.	3410.	3211.	2084.	739.
XNH, RPM	5631.	9525.	9283.	8186.	5643.

EMISSION DATA

CO, PPM	745.7	13.4	11.9	98.0	703.3
CO2, PCT	1.840	4.290	3.940	2.420	1.810
HC, PPM	713.4	16.8	15.2	20.0	669.8
NO, PPM	5.3	433.6	338.4	65.7	8.8
NOX, PPM	16.6	472.8	367.5	83.5	18.0
EICO	75.40	0.60	0.60	8.10	72.60
EIHC	42.20	0.50	0.05	1.00	40.40
EINO	0.90	34.90	29.50	9.10	1.50
EINOX	2.82	38.01	32.06	11.61	3.12
SMOKE	4.2	2.4	2.4	1.9	2.5
FARGAS	0.00944	0.02016	0.01854	0.01155	0.00926
CEFF	94.57	99.94	99.95	99.73	94.79

CORRECTED DATA

T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	992.	13682.	11302.	3853.	978.
EICOK	73.26	0.57	0.57	7.97	71.96
EIHCK	39.86	0.45	0.05	0.97	40.40
EINOXK	2.86	39.33	33.22	11.79	3.15

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.855	87.2
EPAPHC	0.445	45.3
EPAPNOX	0.619	63.1

MAX SMOKE = 4.2

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 10/30/79 CF6-6D ESN 451-560 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	10.	13.	15.	18.	21.
FNK, LB	1331.	39743.	33622.	11970.	1392.
T2, F	59.1	61.8	61.8	64.2	66.8
HUM, GR/LB	41.	43.	44.	45.	45.
BARO, PSIA	14.496	14.494	14.494	14.487	14.481
P2, PSIA	14.488	14.363	14.381	14.440	14.473
W2, PPS	250.	1297.	1197.	729.	250.
T3, F	291.	931.	876.	626.	299.
P3, PSIA	39.2	356.7	311.9	146.8	39.2
W36, PPS	23.4	160.5	145.9	79.3	23.4
WFE, PPH	981.	13494.	11219.	3799.	973.
FAR4	0.01170	0.02350	0.02150	0.01340	0.01160
FAR8	0.00950	0.01910	0.01750	0.01090	0.00940
XNL, RPM	753.	3410.	3211.	2084.	739.
XNH, RPM	5631.	9525.	9283.	8186.	5643.
EMISSION DATA					
CO, PPM	663.8	12.5	10.8	84.4	606.8
CO2, PCT	1.640	4.060	3.690	2.080	1.600
HC, PPM	629.6	16.8	14.5	18.1	576.0
NO, PPM	5.2	410.1	311.5	56.8	8.1
NOX, PPM	15.2	447.1	338.4	71.4	16.1
EICO	75.40	0.60	0.60	8.10	71.00
EIHC	41.80	0.50	0.50	1.00	39.40
EINO	1.00	34.70	28.90	9.20	1.60
EINOX	2.88	37.83	31.41	11.55	3.16
SMOKE	2.8	2.9	2.1	1.7	2.5
FARGAS	0.00842	0.01913	0.01741	0.00992	0.00817
CEFF	94.61	99.94	99.95	99.72	94.92
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	992.	13682.	11302.	3853.	978.
EICOK	73.26	0.57	0.57	7.97	70.37
EIHCK	39.48	0.45	0.45	0.97	39.40
EINOXK	2.92	39.15	32.55	11.73	3.19

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.851	86.7
EPAPHC	0.443	45.2
EPAPNOX	0.612	62.4

MAX SMOKE = 2.9

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 11/13/79 CF6-6D ESN 451-562 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	9.	14.	11.	12.	13.
FNK, LB	1346.	39761.	33310.	11880.	1372.
T2, F	44.5	43.9	45.2	44.5	44.0
HUM, GR/LB	19.	19.	19.	19.	19.
BARO, PSIA	14.504	14.507	14.503	14.505	14.506
P2, PSIA	14.496	14.377	14.382	14.455	14.498
W2, PPS	243.	1295.	1191.	724.	243.
T3, F	270.	894.	839.	588.	263.
P3, PSIA	38.2	357.2	313.0	146.0	38.4
W36, PPS	23.3	164.0	148.8	80.9	23.7
WFE, PPH	961.	13127.	10740.	3658.	920.
FAR4	0.01150	0.02230	0.02010	0.01260	0.01080
FAR8	0.00940	0.01810	0.01630	0.01030	0.00880
XNL, RPM	727.	3354.	3147.	2036.	723.
XNH, RPM	5554.	9386.	9129.	8027.	5513.
EMISSION DATA					
CO, PPM	847.0	14.5	12.5	133.9	817.9
CO2, PCT	1.830	4.100	3.660	2.250	1.730
HC, PPM	827.3	16.2	23.9	36.5	820.5
NO, PPM	5.2	423.0	304.1	52.0	4.9
NOX, PPM	15.3	455.5	331.0	73.5	15.6
EICO	85.10	0.70	0.70	11.90	86.50
EIHC	48.40	0.50	0.80	1.90	50.50
EINO	0.90	35.30	28.30	7.70	0.90
EINOX	2.57	38.00	30.81	10.91	2.76
SMOKE	7.1	3.8	3.5	2.2	4.9
FARGAS	0.00956	0.01941	0.01736	0.01082	0.00908
CEFF	93.81	99.94	99.92	99.56	93.59
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	987.	13634.	11206.	3768.	946.
EICOK	77.44	0.61	0.61	10.62	77.55
EIHCK	39.34	0.34	0.56	1.41	39.05
EINOXK	2.59	39.74	32.15	11.19	2.82

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.911	92.9
EPAPHC	0.439	44.7
EPAPNOX	0.597	60.9

MAX SMOKE = 7.1

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 11/13/79 CF6-6D ESN 451-562 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	9.	14.	11.	12.	13.
FNK, LB	1346.	39761.	33310.	11880.	1372.
T2, F	44.5	43.9	45.2	44.5	44.0
HUM, GR/LB	19.	19.	19.	19.	19.
BARO, PSIA	14.504	14.507	14.503	14.505	14.506
P2, PSIA	14.496	14.377	14.382	14.455	14.498
W2, PPS	243.	1295.	1191.	724.	243.
T3, F	270.	894.	839.	588.	263.
P3, PSIA	38.2	357.2	313.0	146.0	38.4
W36, PPS	23.3	164.0	148.8	80.9	23.7
WFE, PPH	961.	13127.	10740.	3658.	920.
FAR4	0.01150	0.02230	0.02010	0.01260	0.01080
FAR8	0.00940	0.01810	0.01630	0.01030	0.00880
XNL, RPM	727.	3354.	3147.	2036.	723.
XNH, RPM	5554.	9386.	9129.	8027.	5513.
EMISSION DATA					
CO, PPM	778.0	12.7	11.8	116.0	740.8
CO2, PCT	1.640	3.900	3.470	2.010	1.550
HC, PPM	796.9	15.5	23.6	31.3	776.6
NO, PPM	4.9	400.6	290.6	49.5	5.7
NOX, PPM	14.2	434.2	318.7	66.9	14.2
EICO	86.70	0.70	0.70	11.50	87.20
EIHC	51.60	0.50	0.80	1.80	53.10
EINO	0.90	35.10	28.50	8.20	1.10
EINOX	2.64	38.06	31.25	11.11	2.78
SMOKE	5.5	4.1	3.7	2.9	4.4
FARGAS	0.00862	0.01846	0.01647	0.00966	0.00816
CEFF	93.49	99.94	99.91	99.57	93.35
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	987.	13634.	11206.	3768.	946.
EICOK	78.90	0.61	0.61	10.26	78.18
EIHCK	41.95	0.34	0.56	1.33	41.06
EINOXK	2.66	39.80	32.61	11.39	2.84

EPA PARAMETER (ENGLISH AND METRIC UNITS)	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.922	94.0
EPAPHC	0.465	47.4
EPAPNOX	0.604	61.6

MAX SMOKE = 5.5

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 11/19/79 CF6-6D ESN 451-563 JET-A
SAMPLING MODE FAA DIAMOND RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	A	A	A	A	A
RDG	19.	20.	21.	22.	23.
FNK, LB	1371.	39801.	33574.	12080.	1369.
T2, F	66.4	67.2	65.9	66.2	65.2
HUM, GR/LB	44.	44.	44.	44.	44.
BARO, PSIA	14.474	14.477	14.480	14.480	14.482
P2, PSIA	14.467	14.336	14.357	14.432	14.474
W2, PPS	248.	1294.	1193.	726.	248.
T3, F	298.	942.	884.	629.	296.
P3, PSIA	38.6	356.3	312.4	146.5	38.8
W36, PPS	23.4	160.1	145.4	79.3	23.8
WFE, PPH	945.	13631.	11181.	3774.	928.
FAR4	0.01130	0.02380	0.02150	0.01330	0.01090
FAR8	0.00920	0.01940	0.01750	0.01080	0.00880
XNL, RPM	729.	3429.	3225.	2086.	731.
XNH, RPM	5642.	9579.	9328.	8215.	5642.
EMISSION DATA					
CO, PPM	786.0	15.1	13.6	73.5	770.6
CO2, PCT	1.770	4.470	4.040	2.450	1.710
HC, PPM	739.9	26.1	22.6	21.9	709.6
NO, PPM	4.3	463.4	340.2	64.8	5.0
NOX, PPM	14.2	499.5	369.6	81.4	13.7
EICO	82.10	0.70	0.70	6.00	83.30
EIHC	45.20	0.70	0.70	1.10	44.80
EINO	0.80	35.70	28.90	8.90	0.90
EINOX	2.49	38.52	31.41	11.20	2.48
SMOKE	6.9	4.7	4.5	4.3	4.9
FARGAS	0.00915	0.02103	0.01904	0.01167	0.00884
CEFF	94.16	99.92	99.93	99.77	94.16
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	950.	13800.	11327.	3803.	934.
EICOK	80.55	0.69	0.68	5.94	81.53
EIHCK	44.88	0.68	0.67	1.09	43.85
EINOXK	2.53	39.10	32.00	11.28	2.52

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.891	90.9
EPAPHC	0.482	49.2
EPAPNOX	0.598	60.9

MAX SMOKE = 6.9

CF6 ENGINE EMISSIONS TEST SUMMARY

TEST DATE 11/19/79 CF6-6D ESN 451-563 JET-A
SAMPLING MODE EPA CRUCIFORM RAKE

ENGINE TEST DATA POWER SETTING	GIDL	T/O	C/O	APP	GIDL
RAKE	B	B	B	B	B
RDG	19.	20.	21.	22.	23.
FNK, LB	1371.	39801.	33574.	12080.	1369.
T2, F	66.4	67.2	65.9	66.2	65.2
HUM, GR/LB	44.	44.	44.	44.	44.
BARO, PSIA	14.474	14.477	14.480	14.480	14.482
P2, PSIA	14.467	14.336	14.357	14.432	14.474
W2, PPS	248.	1294.	1193.	726.	248.
T3, F	298.	942.	884.	629.	296.
P3, PSIA	38.6	356.3	312.4	146.5	38.8
W36, PPS	23.4	160.1	145.4	79.3	23.8
WFE, PPH	945.	13631.	11181.	3774.	928.
FAR4	0.01130	0.02380	0.02150	0.01330	0.01090
FAR8	0.00920	0.01940	0.01750	0.01080	0.00880
XNL, RPM	729.	3429.	3225.	2086.	731.
XNH, RPM	5642.	9579.	9328.	8215.	5642.
EMISSION DATA					
CO, PPM	728.7	14.3	13.2	67.2	717.3
CO2, PCT	1.690	4.200	3.810	2.230	1.620
HC, PPM	679.4	24.8	21.6	23.6	669.3
NO, PPM	5.4	431.7	319.8	60.3	6.4
NOX, PPM	13.8	471.3	350.3	74.7	13.2
EICO	79.90	0.70	0.70	6.00	81.90
EIHC	43.50	0.70	0.70	1.20	44.70
EINO	1.00	35.40	28.80	9.10	1.20
EINOX	2.53	38.62	31.52	11.28	2.53
SMOKE	5.1	4.4	4.9	3.3	5.0
FARGAS	0.00872	0.01977	0.01797	0.01063	0.00837
CEFF	94.35	99.92	99.92	99.75	94.21
CORRECTED DATA					
T3RF, F	299.	946.	890.	630.	299.
P3RF, PSIA	39.9	362.8	317.8	148.6	39.9
HUMRF, GR/LB	44.0	44.0	44.0	44.0	44.0
WFEK, PPH	950.	13800.	11327.	3803.	934.
EICOK	78.39	0.69	0.68	5.94	80.16
EIHCK	43.19	0.68	0.67	1.19	43.75
EINOXK	2.57	39.20	32.11	11.36	2.57

EPA PARAMETER (ENGLISH AND METRIC UNITS)

	LB/1000 LB THRUST	G/KN THRUST
EPAPCO	0.871	88.8
EPAPHC	0.470	47.9
EPAPNOX	0.600	61.2

MAX SMOKE = 5.1

* U S. GOVERNMENT PRINTING OFFICE : 1980 628-163/2554